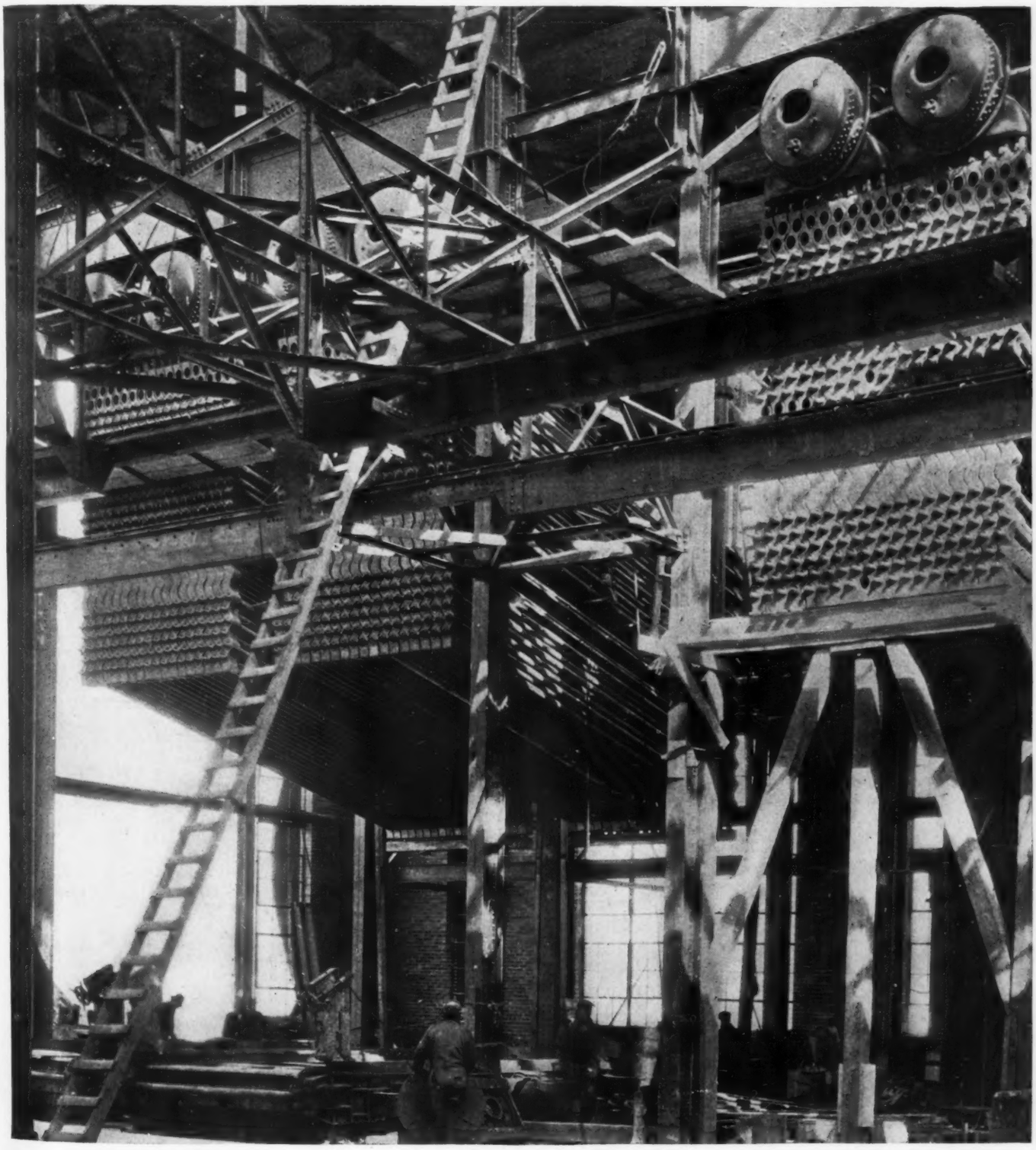
JUN 27 1923

# Electrical World

McGraw-Hill Company, Inc.

*June 23, 1923*

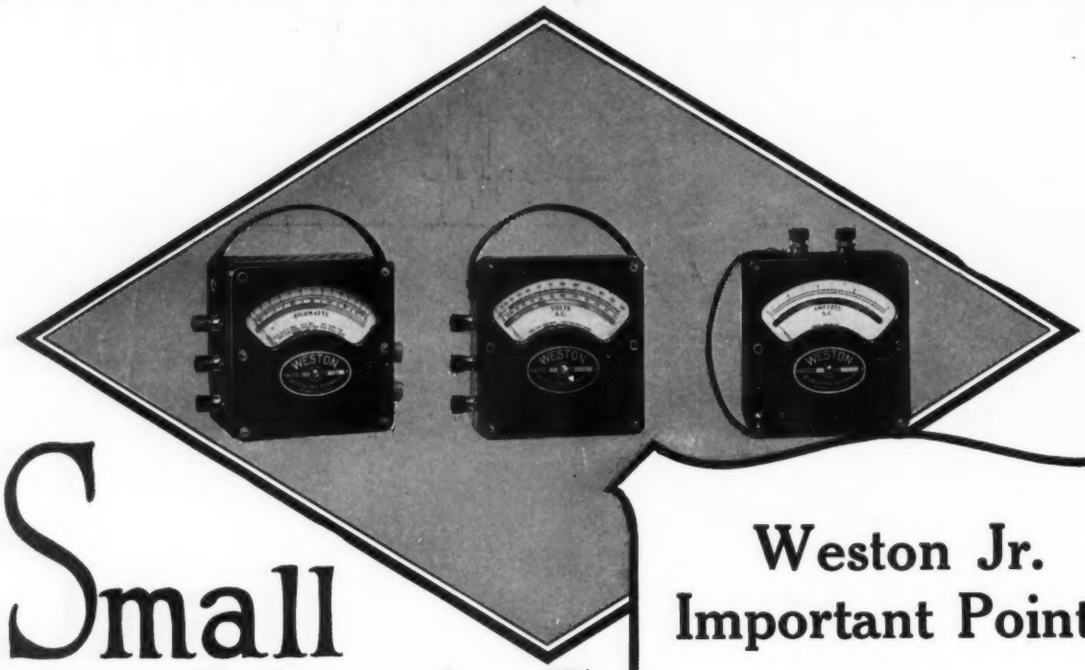
Twenty-five Cents Per Copy



Quick Calculation of Line Regulation
Automatic Substations for Mines
Management of Sales Districts
Compensation for Salesmen

**50,000-Kva. Pine Grove Station of East Penn Electric Co.**
**One of the 40 steam installations now under way in this country involving 2,400,000 kva. in new capacity**

Periodical Inspections Maintain Service
Reactors for Distributing Loads
Uniformity in Demand Rates
Electric Drive for Ice Plant



# Small Portable A.C. Instruments

These instruments are designed for the use of Electrical Engineers, Power Plants, Industrial Plants, Factories, and Central Stations.

Accurate observations by many impartial observers have shown them to be the most efficient in commercial use.

These small Portable A.C. Instruments insure greater convenience and economy with characteristic Weston dependability. They are the only instruments of this size and type that will improve testing conditions and give perfect satisfaction for general Factory and field tests.

***Let us send you Our Bulletin 2006, illustrating and describing these exceptional instruments. Write for it today.***

## Weston Jr. Important Points

Convenient
Light weight—3¼ lbs.
Compact
Accurate
Bakelite cases
Negligible temperature errors
Shielded against magnetic fields
Strong carrying handles
Low cost

**Wattmeters, Voltmeters, Ammeters, Milliameters**

## Weston Electrical Instrument Company

**13 Weston Ave., Newark, N. J.**

New York, Chicago, Philadelphia, Boston, Cleveland, Detroit, St. Louis, San Francisco, Denver, Cincinnati, Pittsburgh, Buffalo, Rochester, Minneapolis, Jacksonville, Seattle, Syracuse

**Represented by Northern Electric Co., Ltd., in:**

Montreal, Halifax, Quebec, Ottawa, Toronto, Hamilton, London, Windsor, Winnipeg, Regina, Calgary, Edmonton, Vancouver

**Represented by Powerlite Devices, Limited, Toronto.** **Powerlite Devices, Limited, Montreal (for Power House Sales only).**

***Branches in Principal Cities Throughout the World***

*Electrical Indicating Instrument Authorities Since 1888*

# WESTON

**STANDARD - The World Over**

# Electrical World

*The consolidation of Electrical World, Electrical Engineer and American Electrician*

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

*Volume* 81 New York, Saturday, June 23, 1923 *Number* 25


# How Much Do You Believe?

THEORETICALLY all electrical men believe in electricity. They are convinced that electric light is the best light and electric power the best power and that the modern home should be equipped with all the modern electrical appliances. But how much do they believe?

Not long ago the president of a large electrical appliance manufacturing company was riding on a Western train with a party of electrical men bound to an electrical convention. The conversation worked around to merchandising policies and the future of appliances. The manufacturer asked all of them in turn if in their homes they were then using washing machines, ironing machines and vacuum cleaners. None of them was, though one of these men was selling this manufacturer electrical supplies in quantity and another sold him advertising space. He took two orders on the spot.

They all believed in these three appliances—but how much? It is another case of "Physician, heal thyself!"

Within the last few months there have been a number of contests held at meetings of electrical people to see which one lives in the best electrically equipped home. At the N. E. L. A. convention, as told elsewhere in this issue, several prominent central-station men won prizes and some others equally prominent were far down on the list. But each time a mere fraction of those present and eligible enter the contest. Only a handful can claim any adequate equipment. In every case it has been a striking demonstration of the fact that electrical men, at least in their own homes, are not "doing it electrically." They believe in electrical appliances, but apparently not enough to offset the inertia of the too common attitude that these are devices to be sold for other folk to use.

There are about 150,000 employees of the central stations that serve the U. S. A. Half of them might easily be using several appliances. One-tenth of them could be living in homes completely electrically equipped. This would mean 15,000 permanent electric homes on demonstration through the land, each exhibiting to its neighborhood and its own circle of friends the benefits of modern electric service. Consider what an influence for the more extended use of electricity such a conspicuous example would be.

# Frederick Darlington

*A specialist in the conservation of natural resources and the increasing of human efficiency by the use of power.*

A STRIKING exemplification of the progress made by engineering science in recent years is found in the fact that it is necessary to deal with aggregations of engineering projects involving large areas and aggregations of industry when planning a power system. Men with a creative imagination and broad vision are required to grasp modern complex power situations.

Economical planning to meet the present and future needs for power is the inspiring task of Frederick Darlington, consulting engineer for the Westinghouse Electric & Manufacturing Company. Among the details that figure conspicuously in his plans are the development of water powers, the centralization of the generation of power, the elimination of all small and inefficient power plants, the electrification of the railroads and the general use of electricity for all possible purposes.

Though Mr. Darlington has always advocated these principles, he was especially impressed with the necessity of their adoption on a national scale through his experience as chief of the Power Section of the War Industries Board.

Mr. Darlington was born at Lincoln University, Pa., in 1867. He was graduated from the Pennsylvania State College in 1886. His first work of consequence was as chemist for the Westinghouse Electric Company in 1891, when he took part in some of the early developments of electrochemistry. He then joined the United Electric Light & Power Company and the Brush Illuminating Company, New York, engaged with construction and operation; but in 1898 he gave this work up for the more congenial task of undertaking engineering and scientific investigations in gases and electrochemical reactions with William Stanley and C. C. Chesney in Great Barrington, Mass.

In 1898 he again became associated with the Westinghouse Electric & Manufacturing Company in an engineering capacity, and in 1905 he was appointed vice-president and general manager of the Alabama Power Company, where he once more encountered the practical details of electrical engineering.

In order to be a factor in the preparation and execution of plans for nation-wide development, he accepted in 1913 the position of consulting engineer with the Westinghouse organization, which post he has held ever since except for an interval during the war.

Mr. Darlington is interested in many activities in the industry and possesses a host of friends. He is a fellow of the A. I. E. E. and a member of the Union League, Engineers', Lawyers' and other clubs.

# Editorial Comment

Electrical World, June 23, 1923

Volume 81 Number 25

### A Gifted Engineer Passes Away

IN THE death of Dr. Louis Bell of Boston the electrical industry loses an engineer of wide reputation and great versatility—one who added dignity and luster to the profession he represented and whose acquaintanceship was highly prized abroad as well as at home. Dr. Bell grew up with and formed part of the electrical industry. He was a pioneer in the transmission of electrical energy and in the art of illumination. He it was who proposed fifty cycles as a standard frequency at a time when frequencies were uncommonly numerous, but his proposal, except in southern California, went unheeded, and, as it subsequently developed, much to the industry's loss. Dr. Bell plied a facile and gifted pen and from 1890 to 1892 he was editor of the ELECTRICAL WORLD and up to the time of his death a valued editorial contributor.

He possessed a strong personality and was fearlessly aggressive. What he believed he believed with all his might. There was no half-heartedness in his advocacy. He held firm convictions, never stood on ceremony in expressing them and was an excellent champion for causes he approved. To the staff of the ELECTRICAL WORLD Dr. Bell's loss comes as a wrench after years of close association and good fellowship. Long acquaintance served but to increase esteem and admiration. His departure removes from the industry a figure of influence and force, while at the same time adding to the list of departed leaders who have left examples worthy of emulation.

### Higher Temperatures Must Await Developments in Metallurgy

IT WAS very encouraging to hear Fred N. Bushnell of Stone & Webster express the opinion before the Technical Section of the National Electric Light Association at the recent convention that he is confident of the soundness of seeking greater plant economies through use of higher steam pressures. Materials and methods available at present will probably permit the use of steam pressures up to 1,200 lb., but temperatures higher than 750 deg. must await further developments in metallurgy. There is no proposal to go to temperatures which materials have not already proved their ability to withstand.

Since the opinion is expressed by several authorities that higher temperatures cannot be handled with existing designs and materials, it behooves the industry, and especially manufacturers of pipes, valves and fittings, to make exhaustive tests of the characteristics of different metals at temperatures above those now considered standard. A fruitful source of information will be supplied if analyses are made of the results which are being obtained with high-temperature pipes, valves and fittings in the oil-refinery field. There must surely be a definite determination made as to whether the elastic limit of steel is greatly lowered by high temperatures since deformation of the metal thereby may be the chief cause contributing to ultimate failure. Torsional strength of heated steel and fatigue of structures when subjected to expansion and contraction under stress and high temperature offer other subjects for investigation. Studies must also be made of designs which are particularly adapted to equalizing high-temperature stresses as well as of construction which will permit the least serious deformation. It is not to be doubted that the answers to these many questions will lead to high-temperature practices, but engineers are not minded to experiment much without knowing the ground they are treading.

### A Permanent Place for Electrical Exhibitions

ELSEWHERE in this issue information will be found about the newly completed permanent "home of electrical industries" in Leipsic. While there is nothing in this country that corresponds to the "Leipziger Messe," an annual fair on an international scale, yet our electrical industry is surely of such importance that it should have annual co-operative exhibition places in New York and in Chicago, and possibly in a few other industrial centers. Any one who has had anything to do with temporary exhibits and with annual shows knows how unsatisfactory it is to demonstrate electrical apparatus under crowded conditions in a flimsy booth, without adequate wiring or supports, and before visitors who are mostly bent on having a good time or are collecting souvenirs. Contrast this with a large stone building of dignified architecture bearing an inscription "Permanent Exhibit of Electrical Industries," where various manufacturers could have permanently assigned space fitted to suit their particular requirements. The exhibitors could show the same apparatus year after year, making changes where new types have been developed.

In New York the best place for such a home would probably be near the Engineering Societies Building, and the exhibit building could be open either the year around or only during the winter months when conventions and meetings of all sorts occur there in almost uninterrupted succession. In fact, such a permanent exhibition should become an additional attraction of the city.

Already other industries have permanent exhibits in this country, so that the electrical industry of America could not claim the distinction pertaining to the industry in Germany of having built the first permanent exhibit home. Nevertheless the time is ripe to give this matter serious thought. Groups of our industry are already linked together through the Joint Committee for Business Development, the Society for Elec-

trical Development and other associations. It should not be difficult to obtain co-operation for building and operating a few homes for exhibits, the stock to be held principally by the exhibitors themselves. The idea of the "home electrical" has been tried on a small scale and proved to be a great success, electrical shows have drawn large attendance in many cities, and it would seem that the same idea extended to exhibitions of applications of electricity in various industries should be a still greater success. The advantages to our foreign trade of a national exhibit home should also be borne in mind.

## At Last Some One Takes Notice of the Operating Man

STANDARDS have been made in technical nomenclature, standards have been worked out for ratings, standards for tests, standards for this, that and the other; but it has apparently not occurred to any one to produce any group standards for the operating man in whose care equipment is placed and upon whom dependence is placed for continued uninterrupted satisfactory service. Individual manufacturers have issued instructions on particular equipment; individual operating companies have devised their own operating codes. But it has remained for the Electric Power Club to take a real constructive step by starting to issue a series of booklets, as a group activity, on the care and operation of various classes of equipment within the purview of the club. The first booklet is that on the "Care and Operation of Power Transformers"—an eight-page pamphlet, just issued, which can be obtained from any member of the Transformer Section of the club.

Those who are charged with the care and operation of electrical equipment will certainly be grateful to the club members for following their equipment into service and for their joint action, as a club, in extending their standardizing efforts to the use of equipment as well as to its manufacture and rating.

## The S. E. D. Finding Its Place and Gaining Prestige

THERE is real encouragement to electrical men in the evidences, now multiplying, that the Society for Electrical Development is at last finding itself and becoming established as the recognized workshop to which publicity and promotional jobs may be taken by any group in the industry with the assurance that they will be effectively done. The N. E. L. A. Commercial Section at the recent convention reported the organization of three national campaigns for the promotion of industrial heating, electric ranges and electric trucks, and the operation of these campaigns is placed in the hands of the society. The society is also harmoniously functioning as the workshop of the Joint Committee for Business Development, providing the working staff and producing the printed matter which the joint committee divisions require. These activities are all being co-ordinated through the Advisory Publicity Council and good progress is being made.

Now comes the announcement that F. M. Feiker is to join the staff of the society, subject to special work which he is now doing for the United States Department of Commerce and for which he was reluctantly released by the McGraw-Hill Company. The further fact that W. E. Robertson, W. I. Bickford, N. G. Harvey and George E. Cullinan have joined the directorate of the society in the jobber group, George F. Morrison and H. D. Shute in the manufacturers' group, C. L. Chamberlain and W. A. Jackson in the contractors' group, and E. N. Hurley and E. W. Rockafellow as directors-at-large will add to the prestige of the S. E. D. as an industry institution.

It has taken a long time for the society to find its true place in the industry as a common, neutral workshop in the center of the various class associations of electrical men, available to serve them all. It has been hard to "sell" this conception of its function to the associations. Under the wise guidance of C. L. Edgar and W. W. Freeman, however, the dreams of J. Robert Crouse, that pioneer in co-operation, seem to be crystallizing in service of the most practical sort, with good promise of adequate financing to carry out the high hopes of those leaders of the industry who in 1913 organized the society, so confidently seeing in it an instrument of advancing the common interests of all classes of electrical men through commercial development.

## Beneficial Effects of Currents on Molten Metals

THAT metals melted in electric furnaces usually have better physical properties than those otherwise wrought has long ago been found out from practice, but all the "whys and wherefores" are not yet fully and clearly understood. If the exact nature of the action which produces this betterment were more clearly understood, it might be possible to increase, hasten or cheapen the production of these desired effects. In the June 16 issue of the ELECTRICAL WORLD Dr. Saklatwalla made some interesting suggestions concerning the possible effect on physical properties of metals. For steel the extremely high temperatures of the arc no doubt have some beneficial effect in producing greater fluidity, but the current itself, owing chiefly to the energy in the flux surrounding it, is now known to produce important useful effects by developing forces some of which were recognized and studied only within the last decade or two. By properly directing these forces they may, for instance, be made to produce an upward circulation which brings all the particles of suspended impurities and gases in turn to the surface, where they then remain or are caught by the slag, thus hastening and improving the slow and expensive "killing" process still in use.

When a current passes through a column of molten metal at sufficiently high current densities, one of these magnetic forces, known as the pinch effect, acts in a manner analogous to that of a centrifugal separator, forcing the better conducting materials to the central axis and thereby squeezing the more poorly conducting materials, like slags, oxides or gases, to the outside of the column. This force is shown strikingly by passing a sufficiently large current through a trough of mercury on which is floated an amalgamated copper rod—when the current is passed this rod instantly disappears, being sucked to the central axis. Vibrations produced by alternating magnetisms may, also, by the different inertias of different materials or by different induction

in heterogeneous masses, produce desired effects. When an iron bar is held over a trough of liquid metal through which a large current is passing, these forces will raise up the metal, forming the curious effect of a steady little hill of the liquid, which is sustained dynamically by a strong upward flow; if the iron bar is held below, the forces produce a depression which may break the circuit. A horizontal magnetic flux passing through such a trough from side to side in the proper direction produces the same effect as greatly increasing the gravity force on the better conductors, thus tending to separate the poorer conductors by causing them to float. A density of about 4 has in this way been given to water for concentrating minerals.

As iron at a red heat loses its property to add more magnetism to that of the current, one is apt to conclude that there is little magnetism around the current alone; but in furnaces in which the heating is desired the current densities may be made very great, and the kind of magnetism which is produced by the current alone is not destroyed by heat. Moreover, the energy in it increases as the square of the current; hence the forces which it could produce may become quite formidable. It seems that most of the wrought brass produced in this country is now being refined and made homogeneous by the proper application of some of these newer electromagnetic forces. The very thorough stirring which these forces may be made to produce when properly applied not only produces the much desired homogeneity of alloys, but doubtless also finer grains which deter segregation. Some of these forces have now been recognized, studied and applied; there may be others that have not yet been studied and are not yet described in textbooks. Human inertia in resisting the acceptance of new forces not included in the older "classics" is unfortunately very great, which makes progress slow and difficult. Besides the useful mechanical action of these newer forces, it is not at all unlikely that a current might also produce molecular or atomic effects, now that we know that the electron, with its strong electromagnetic and electrostatic forces and immense quantities of energy, plays such an important part in the constitution of the atom.

## A Chart for Line Regulation

WHEN an engineering problem is reducible to comparatively simple mathematics and when in the course of routine office work such a problem has to be solved a great many times for different numerical data, some one is sure to find a short cut in the form of a chart, a table, a specal slide rule, a mechanical device or something else. Most of these "first aids to the rushed" never leave the office in which they have originated. They may even remain in the notebook of the man who evolved them as part of his personal stock in trade. Now and then a public-spirited engineer gives to the profession at large the benefit of a short-cut method and thus scores for himself another point in the forthcoming argument with St. Peter.

Dr. Hutchinson's chart for a quick calculation of line-voltage regulation, published in this issue, commends itself because of the extreme ease with which it can be used, even by the proverbial "office boy." Its simplicity is due to a skillful arrangement of the two sets of curves and also to the fact that the line capacitance and leakage have been neglected. In other words, only the line resistance and inductance are taken into consideration. Of course, this limits the use of the chart to lines and other electrical devices where such a simplification of the actual conditions is permissible. With these limitations the shart should find its place of usefulness in the notebook of any engineer who deals with short transmission and distributing lines. It must be left to the engineer's judgment whether or not this chart should be used when the capacitance is also an appreciable factor. After all, sound judgment is one of the most valuable assets in an engineer, and if he lacks judgment, it may not be safe to intrust him even with a plain multiplication table.

## A Commendable Solution to the 40-Deg.-50-Deg. Controversy

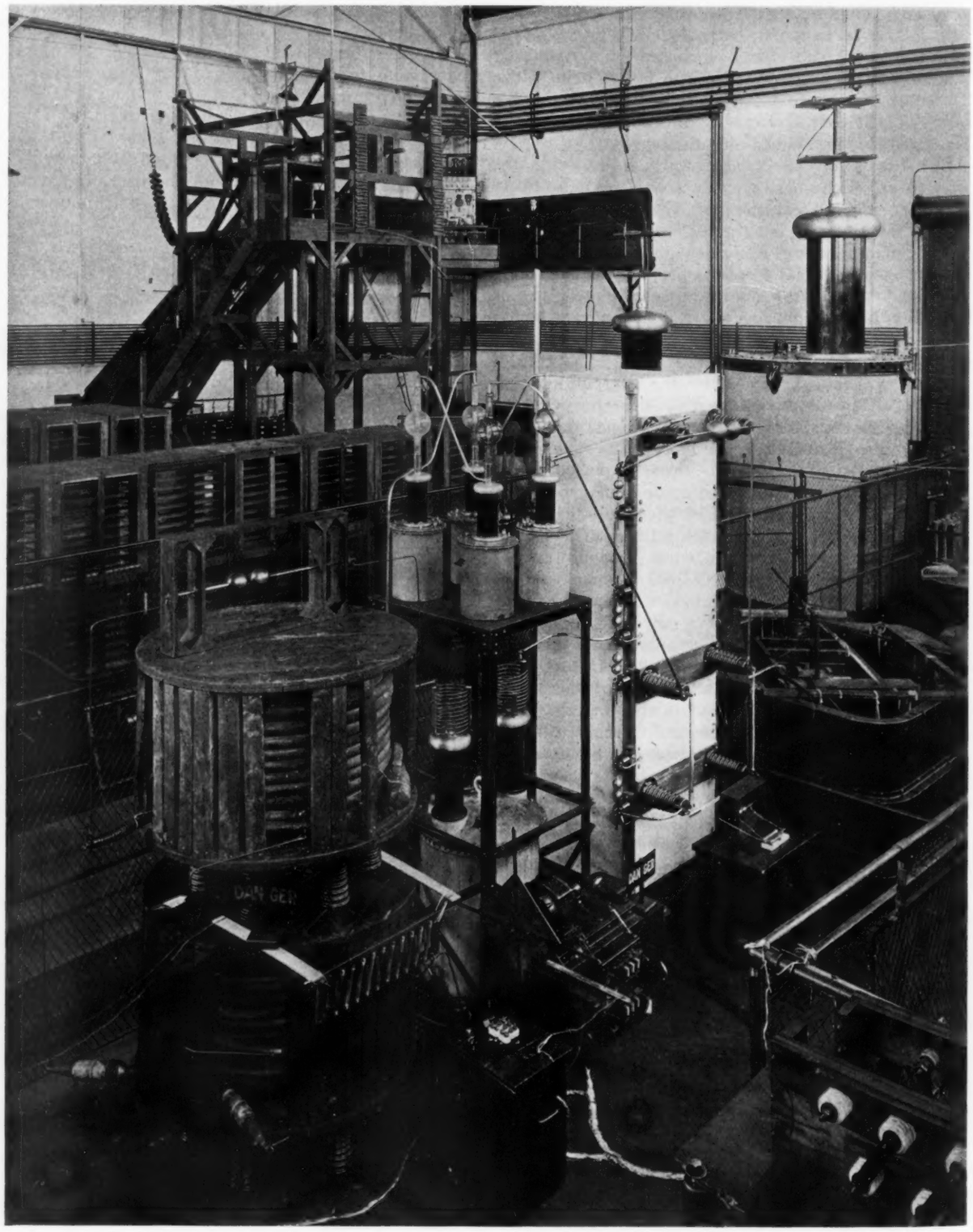
THE purchaser of general-purpose motors, as has repeatedly been pointed out in these columns, is interested primarily in knowing that "10 hp." means the same thing every time he buys a 10-hp. motor. That he will be so assured in the future is to be the beneficent result of the Electric Power Club's recent commendable action in abandoning its two standards of rating motors—one the 40-deg.-55-deg. double rating, the other the 50-deg. single rating—and in adopting as "recommended practice" the 40-deg. single rating without definite overload guarantee. This commercial-engineering question has been before the industry, not only nationally, but with international complications, for at least seven years. What particular solution was to be reached was not so important as that a single solution be reached. As was pointed out after the Geneva meeting of the International Electrotechnical Commission committees last fall, commercial experience seemed to dictate that the 50-deg. single rating was not the most workable. The newly recommended standard thus avoids a rating commercially difficult and at the same time provides a single rating without the complication of overload guarantees with given temperature behavior.

It should be noted with gratification that the new rating provides that the non-technical purchaser is assured of a generous motor—that is, a motor with a certain "reserve" capacity—and this is advisable. A technical user who fits his motor to his duty cycles demands temperature curves and other data, but the non-technical user, accustomed to factors of safety in other equipment, has his only protection in having a certain reserve to meet temporary emergencies. This assurance the 40-deg. single rating provides—and this apparently was the demand which made the Geneva conference decide that the 50-deg. single rating was not generally practicable commercially. At the same time, a single rating indicates a definiteness of behavior, which any standard of rating really should do.

The effect of the American decision on the ultimate international standard is, of course, not yet determinable. But it is to be hoped that not only the Power Club but also the rating bodies of other countries will follow the advice of the Power Club's board of governors and change from "recommended practice" for "adopted standard" the definition:

"An open-type general-purpose motor shall be capable of carrying full rated load continuously with a temperature rise not exceeding 40 deg. C."

# Laboratory Where Lightning Is Made to Order



MUCH comment has appeared in the newspapers recently regarding the "terrific" lightning bolts which have been produced artificially at the Pittsfield works of the General Electric Company.

In these manifestations of popular interest engineers will recognize the so-called "lightning generator" with which Steinmetz and Peek have been experimenting for some time. As shown herewith, the equipment consists essentially of a million-volt transformer (in the right background) and stacks of air-dielectric condensers (in the left background) which can be charged from the high-voltage transformer through the medium of kenotrons (on the elevated platform in the foreground).

So far voltages of two million have been obtained. With the condensers in use a large amount of power can be stored up and suddenly released with a very steep wave front.

# Automatic Substations in Mine Service

## Continuity of Service, Good Voltage Regulation, Minimum Wear of Equipment and Flexible Location Are Inherent Characteristics—Field of Application and Economic Comparisons with Manual Operation

By C. E. H. VON SOTHEN
*Power and Mining Engineering Department,*
*General Electric Company*

THE automatic substation is becoming more and more widely used in mines for supplying direct current to the haulage system, cutting machines and pumps. The past year has witnessed a marked increase in the number of equipments sold and installed, principally because of the successful operation of stations previously put into operation. Articles describing some of these installations have been published, so that the method of operation of the automatic station has become quite well known. A discussion of the subject, however, from an economic and operating standpoint may be of assistance to those who have not had an opportunity to study it.

There are a few differences of opinion as to what constitutes an "automatic substation," but the term is generally understood to mean a station which, upon proper indication by a master element, goes into operation by an automatic sequence, maintains by an automatic means the required character of service, shuts down and clears itself upon the opposite indication of the master element, and protects itself while starting, running and shutting down. The master element may be a remote-control switch, time switch, contact-making voltmeter, etc., or the station may be started and stopped by switching the alternating-current supply. Because of the fact that the cost of electrical energy is usually only a few per cent of the cost per ton of coal or ore loaded for shipment, it is usually best to start the equipment in the morning by some device such as a remote-control switch and permit it to run continuously during the hours when it may be needed suddenly. The peaks of a mining load develop so rapidly that a machine usually does not have time, when started by a contact-making voltmeter or ammeter, to get up to speed and on the line in time to be of assistance. There are special cases, of course, where this method of starting may be used to advantage.

Although the cost of electrical energy is only a small part of the total cost of operating a mine, the service rendered by the electrical equipment must be of such a quality that the desired output of coal or ore may be obtained. This is what is meant by "the required character of service" and implies continuity of service and good voltage regulation. It is also important that the apparatus be subjected to the minimum wear consistent with good service and that the equipment be as simple as possible within the limits prescribed by good practice.

It has been found that, because of the elimination of the human element and the possibility of more advantageous location, the quality of service afforded by an automatic substation is better than that rendered by the ordinary manually operated mining substation and equal to that of the best. Most coal mines were operated only a few months last year so that results for a full year are not available, but automatic mining substations have had a severe test and have been found entirely adequate. A synchronous motor-generator equipment which has given very satisfactory service is illustrated in Fig. 3. The station is on the surface approximately 4 miles from the tipple and is started and stopped by a push-button placed at a convenient place on the main haulage. The direct-current feed lines and control wires to the push-button are taken into the mine through a bore hole. This station operates in multiple with four other stations, and the automatic equipment on the direct-current

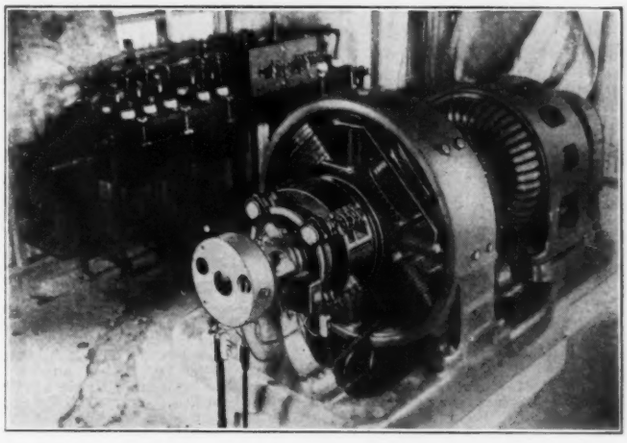


FIG. 1—AUTOMATICALLY CONTROLLED MOTOR-GENERATOR SET OF THE STAR COAL & COKE COMPANY

One of two 150-kw., 550-volt direct-current synchronous motor-generator sets with oil-immersed starting and running contactors and compensators installed at Red Star, W. Va. The set is equipped with speed limit device, bearing temperature relays and flash barriers for the generators.

side was especially designed for the application. It consists of one section of load-limiting resistance and an automatic reclosing equipment. Each of these will be described later.

Voltage regulation is of considerable importance from the standpoint of production, for low trolley voltage results in the slowing up of all the operations of the mine. Owing to their slower speed, motors have to carry overloads for longer periods and may eventually burn out, thus further hampering production. Good voltage regulation therefore has in itself a real economic value. While it was possible several years ago to maintain good voltage at the face by locating the substations near the working places, this has become practically impossible from an economic standpoint because of the great increase in wage rates. Consequently there has developed a practice of grouping the stations, placing one man in charge of several. This results in increased copper losses, increased voltage drop, a greater number of interruptions and longer ones, and an all-around poorer quality of service because one man cannot properly care for several stations.

When the load center is distant from all buildings or places where an attendant would regularly be stationed, an automatic substation, properly located, will save not only the copper and copper losses incident to long feeder runs, but also the wages of one or two operators. The direct-current distribution problem has been successfully solved in this manner at the Drifton colliery of the Lehigh Valley Coal Company.

The workings of this colliery are divided into several sections by the topography of the country. It was found that the haulage requirements of two of these sections could be supplied at 250 volts from a single substation without providing extremely large feeder capacity. In order that the substation might be at the approximate load center of the two sections, it was placed about 3,000 ft. from the nearest point at which an engineer was on

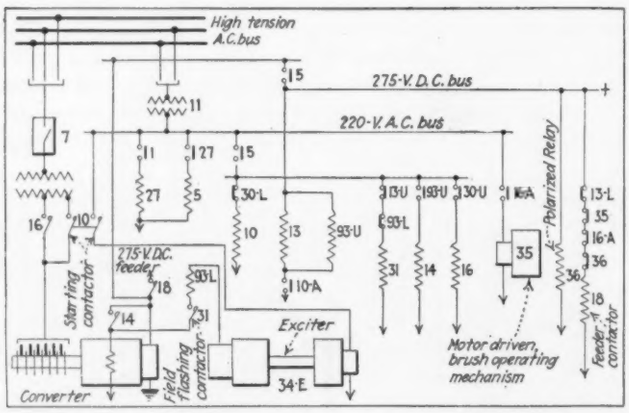



FIG. 2—SIMPLIFIED DIAGRAM OF AUTOMATIC CONTROL FOR MINING CONVERTERS

Assuming the incoming alternating-current lines to be energized and the manually operated oil circuit breaker No. 7 to be closed, closing master starting element No. 1 causes relay No. 27 to close its contacts. This picks up control contactor No. 5, which in turn energizes and closes starting contactor No. 10. This connects the converter to the low-voltage taps on the secondary side of the power transformer; it also connects the motor of the small exciter set, 34E, to the 220-volt alternating-current control bus. Relay No. 13, which is connected across the converter commutator, will pick up only on direct voltage and therefore does not close its upper contacts until the machine reaches synchronism.

When relay No. 13 picks up, it closes field-flashing contactor No. 31, connecting the converter shunt field to the small 250-volt exciter. This connection is maintained until the voltage across the commutator and the flashing current are in the proper direction with respect to each other, as determined by relay No. 93. Proper polarity is therefore assured and the polarizing takes a maximum of only three or four seconds. Relay No. 93, in picking up, drops out contactor No. 31 and closes contactor No. 14, thus self-exciting the machine. At about one-half normal field current relay No. 30 closes its contacts, dropping out starting contactor No. 10 and closing running contactor No. 16. The brushes are next lowered on the commutator by the motor-driven brush-operating mechanism No. 35. Relay No. 36 is a polarized device for verifying the converter polarity, and until it has closed its contact feeder contactor No. 18 cannot close. When the relays of the automatic reclosing equipment indicate proper conditions, contactor No. 18 connects the converter to the 275-volt direct-current feeder.

duty every hour of a twenty-four-hour day, this man being in charge of a slope hoist. An automatic synchronous-converter substation equipment was installed in such a way that it might be started and stopped from the hoist house by means of a remote-control switch and pilot wires. Two direct-current feeders run in opposite directions from the station to the two sections of the mine, being carried through bore holes at the points where they tie in to the trolley.

## PROTECTION AGAINST OVERLOADS

When several manual substations are interconnected on the direct-current side through a trolley or distribution system, the loads may, of course, shift about in such a way as to overload a substation and trip its direct-current circuit breaker. This throws the entire load on the remaining stations and may in an extreme case so heavily overload these stations that their direct-current circuit breakers may open successively. If these breakers do not trip, the stations will continue to supply load, but through such a long length of trolley and feeder that the voltage drop will be excessive. Equipment is available for use with direct-current circuits which permits a station to limit its own load by temporarily inserting one or more blocks of resistance into the feeder, depending upon the amount of overload. Only the excess load is shifted to the other stations, thus providing the greatest continuity of service and best voltage at the working places. Such a "load-limiting" equipment may be applied either to a completely automatic substation or to one which is manually operated on the alternating-current side. Two equipments of the latter type have recently been furnished the Quemahoning Coal Company at Somerset, Pa., for use with 150-kw., 275-volt synchronous motor-generators. One of these is shown in Fig. 4.

Another form of protection for the direct-current side consists of the automatic reclosing equipment. This may be either of two kinds—that for operation independent of any other direct-current source (stub-end feed) or that suitable for either stub-end or multiple feed. In general, these equipments fulfill the following functions:

1. They disconnect the load from the source of power in case the voltage fails or the load exceeds a predetermined value.

2. The load remains disconnected a definite minimum time interval of ten to thirty seconds, regardless of the cause of the opening.

3. At the expiration of this time interval they immediately reconnect the load to the source of power, provided the voltage is restored or the connected load is reduced to a predetermined value. There is no attempt to reclose as long as a short circuit or excessive load remains connected.

The principal advantage of such an equipment over the ordinary manually operated breaker is that it will reclose promptly when conditions have settled down to normal.

The only way in which an operator can tell whether an overload or short circuit has been removed is by trying the circuit out by reclosing his breaker. After several attempts he will usually wait a considerable length of time before trying again, very often causing delays that might have been avoided by the use of the automatic reclosing equipment. The contactor of such an equipment cannot very well be held in by hand during an overload, so that the machines are more fully protected.

## AUTOMATIC OPERATION CAN REDUCE MAINTENANCE DUE TO POOR HANDLING

The greater the degree to which a station can be made automatic, the less will be the wear and tear on the apparatus due to unskillful handling. Because of the present labor shortage, it is more difficult than ever to obtain trained substation operators at the mines, except at very high wages. The result is that the apparatus is more or less abused. Bearings are burned out, circuit breakers are held in during peak loads, resulting in flashovers and burn-outs in machines, and the stations receive little care. If the station is automatically controlled, one trained man can give part of his time to

proper inspection and care. Casual inspections can usually be given daily, but a thorough inspection, during which the various devices are operated by hand, should be given once each week.

In order that the adjustment and operation of these stations may be thoroughly understood by the mine electrician, the automatic equipments have been simplified as much as is consistent with proper operation and protection. In the latest types of control for both motor-generators and synchronous converters for mining service all of the steps in the sequence are performed by relays which respond only to certain electrical conditions. Each switching operation is a direct function of the electrical condition of the apparatus at the particular moment and is dependent upon the proper functioning of the preceding operation. The starting sequence followed for both motor-generators and converters is the same as that considered best practice in manual operation.

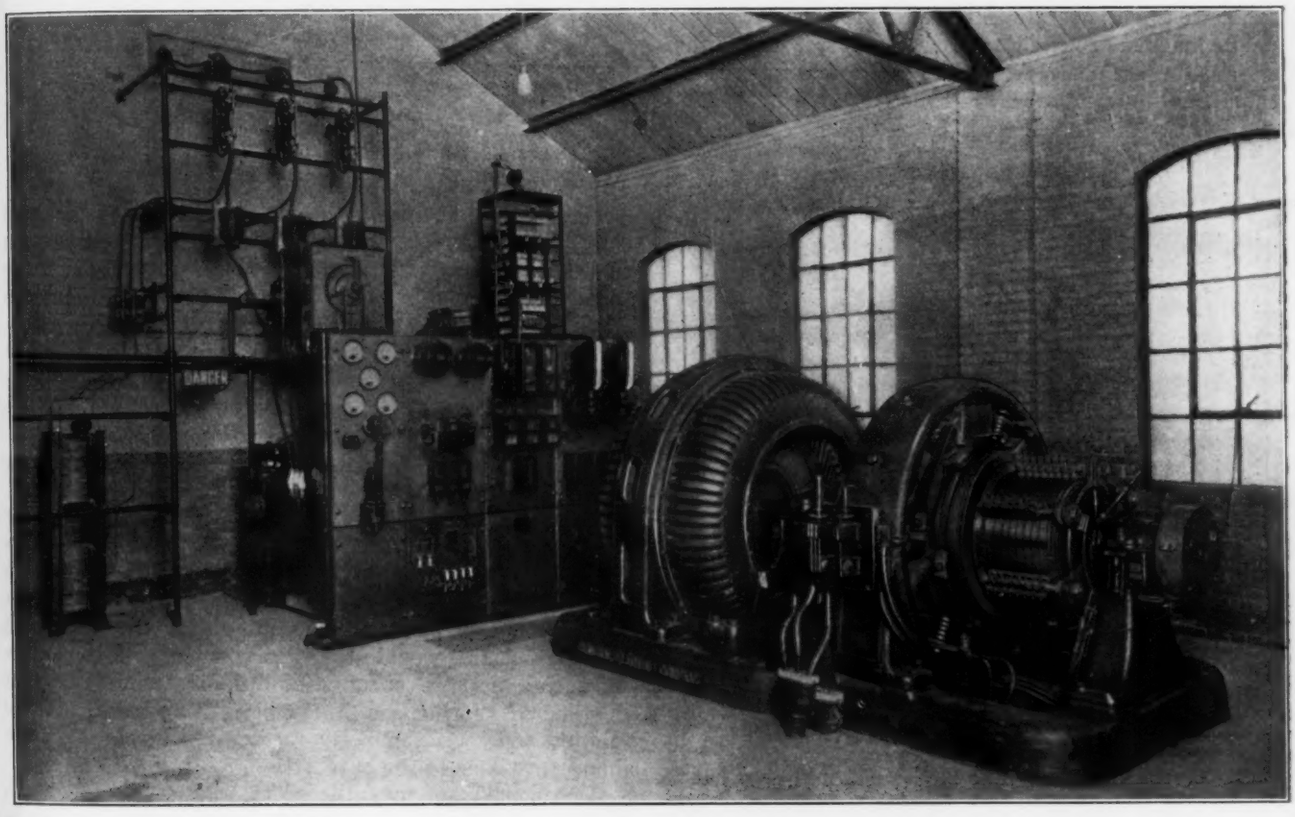


FIG. 3—SYNCHRONOUS MOTOR-GENERATOR EQUIPMENT OF CLEARFIELD BITUMINOUS COAL CORPORATION
The set is rated at 300 kw., 250-275 volts, direct-current, and 6,000 volts, three-phase, 60 cycle, on the alternating-current side. The installation is at Rossiter, Pa.

## SEQUENCE OF OPERATIONS

A simplified diagram of the automatic control for synchronous converters for mining service is shown in Fig. 2. It does not show all of the interlocks and protective relays included in a complete equipment, but only the devices necessary for proper starting sequence.

The standard equipments for both synchronous motor-generators and converters include protection against the following: (1) Severe alternating-current or direct-current overload. (2) Failure to complete starting sequence. (3) Loss of excitation. (4) Single-phase starting and undervoltage on incoming line. (5) Overheated bearings. (6) Overheated machine windings. (7) [illegible] drop in incoming voltage. (10) Reverse power, if the station is operating in multiple with another. (11) Overheated load-limiting resistors (when these are used).

As an example of the rapidity with which the automatic reclosing equipment will operate, it may be stated that in at least two instances it has opened in time to clear a machine when a short circuit was applied to the feeder immediately outside of the station and not more than 25 ft. from the machine. One of these machines was a 275-volt synchronous converter at the mine of the Carbon Fuel Company, South Carbon, W. Va., and the other a 550-volt generator at the Star Coal & Coke Company's mine, Red Star, W. Va. The latter machine was equipped with flash barriers, as shown in Fig. 1. The view also shows the starting and running contactors for the motor and one of the bearing temperature relays. The flashing in each case was so slight that the commutator did not require any attention. In a few instances bearing temperature relays have operated and have always cut the machine off before any damage has resulted. Only a small amount of scraping has been required in order to put the bearings back into condition for use. Wherever the equipment has had proper inspection and care the protection and operation has been most satisfactory.

The protective features are of two kinds—automatic-reset and hand-reset. If the trouble is likely to be of a temporary nature such as overheated machine windings, low alternate-current voltage or overload on the direct-current side, a device is used which will automatically reset when conditions have returned to normal. If the trouble is likely to be of a permanent nature or such that the station should be inspected or repairs made before service is restored, a hand-reset device

is used to give the protection. Examples of this kind of trouble are overheated bearings, loss of excitation and failure to complete the starting sequence. The individual devices are in most cases provided with their own lock-out features, so that it is a simple matter to determine why the station has been shut down.

### FIELD OF APPLICATION FOR AUTOMATIC MINE SUBSTATION

While the automatic substation has distinct advantages over the manual substation, when properly applied, there cannot always be found a justification for its use. There are, of course, no engineering reasons why an automatic substation cannot be used wherever a manual substation will operate satisfactorily and without an undue amount of attention from the operator, but there are quite a few places where the extra investment would be entirely unwarranted. For instance, the workings of

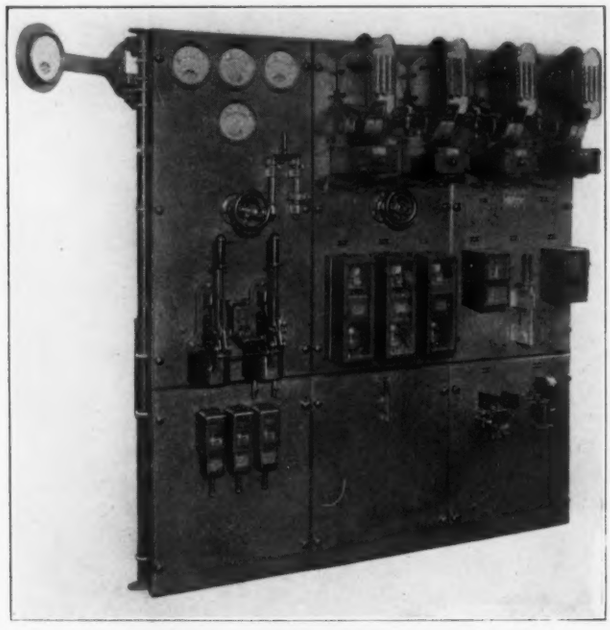


FIG. 4—AUTOMATIC SWITCHING EQUIPMENT OF QUEMAHONING COAL COMPANY, SOMERSET, PA.

Control panels for 150-kw., 2,300-volt, 60-cycle motor-generator set and load limiting equipment for the 275-volt, direct-current feeder.

some mines are so situated that large amounts of power are required in a comparatively small area so that long feeder runs are unnecessary. In such cases there may be advantages to be gained by placing two, three or more machines in the same station, in which case the price of automatic control would be entirely out of line with the saving to be gained by eliminating substation operator.

Again, there are any number of mines at which the substations can be so located that the same man can care for the station and a fan. In other cases the station may be in the same building in which there is located a hoist or shop, so that no additional attendant is required.

However, there are times when the hoist operator or blacksmith is so busy that he cannot give the station proper attention. This often occasions such delays that automatic control, or at least certain automatic features, might well be installed, in order to increase the output of the mine. The increased revenue would then soon pay for the extra investment.

In order that a general idea may be obtained as to the relative total costs of a manually operated and an automatic substation, the following comparison is given. This is based on a 200-kw., 275-volt, direct-current-2,300-volt alternating-current synchronous motor-generator equipment. Assuming the total first cost of the manually operated station to be 100 per cent and referring each item of cost and operation of both the manual and automatic station to it as a base, there results approximately:

| | Manual | Automatic |
|---|---|---|
| | ——Per Cent—— | |
| First cost of apparatus | 72.8 | 111.8 |
| Cost of building | 11.8 | 12.4 |
| Installation (material and labor) | 15.4 | 18.4 |
| Total first cost | 100.0 | 142.6 |
| Excess first cost of automatic over manual | .... | 42.6 |
| Annual fixed charges | 20 | 28.5* |
| Annual attendance charge | 25‡ | 2.5† |
| | 45 | 31.0 |

* 0.20 × 142.6.
† 0.10 × 25.
‡ Based on an attendance charge of $1,700 per year.

The annual saving of the automatic over the manual is therefore 14 per cent of the total first cost of the manual station. Dividing the excess first cost of the automatic by the annual saving (42.6 ÷ 14), it is seen that the extra investment is paid for in three years. After such time the annual saving will amount to about 33 per cent of the extra investment. If an operator is employed for more than one shift the saving will be greater.

Though the relative percentages will vary depending upon the locality, those given are considered a fair average. The comparison does not include charges for power or repairs. The former will be virtually the same for either manual or automatic and the latter are negligible. Account has been taken of the fact that a slightly larger building is required for the automatic control, but this would usually be compensated for by the fact that a more substantial building and a suitable method of heating are required if an operator is to be maintained. Consequently the figures might be made more favorable to the automatic.

The conclusion may therefore be drawn that, while there are many cases in which an automatic station is not justified, there is no question about its economy when properly applied. Whenever additional substation capacity is required, the whole situation should be given careful thought in order that the best procedure may be followed.

## Only Seven Water-Power Generating Plants in Great Britain

A TOTAL of 536 public generating stations in Great Britain is shown by the report of the "Electricity Commission" for the year ended March 31, 1922. Of this number 366 utilized steam as a source of power, fifty-five produced gas, forty-seven oil engines, and the remainder other means, including water power. The electrical division of the United States Department of Commerce states that only seven British stations depend exclusively upon water power, the largest of which produced 18,763,000 kw.-hr. out of a total of 29,107,000 kw.-hr. generated from this source. The total electric power generated during the year 1921 amounted to 4,844,666,038 kw.-hr., of which steam supplied power for approximately 97 per cent.

P. 1455 — 1456
see also p. 1418.



# Periodical Inspections Maintain Service

## Three Forms and Inspection Scheduling Cards Control Equipment Maintenance in Plant of 65,000 Kw.—Records Aid Accounting

BY R. D. GILLESPIE
Chief Engineer Millers Ford Plant, Dayton (Ohio) Power & Light Company

GOOD electrical service can be rendered only with good equipment which is maintained in first-class condition. To maintain equipment in good condition it is very necessary to outline a definite program of routine inspection and repairs covering all of the equipment in a station and also to keep records and costs of the inspections and repairs on each separate piece of apparatus.

Such a system is in use at the 65,000-kw. Millers Ford station of the Dayton Power & Light Company, Dayton, Ohio, covering routine inspections, repairs, maintenance costs and record keeping of each separate piece of equipment in the station, including all auxiliaries. The forms were prepared to get the desired information by the most direct and economical route, and the system is kept in operation by two men.

The records and maintenance costs are kept on the unit plan, giving the cost of maintaining each unit of equipment as a whole or its parts. For example, the costs of maintaining one of the turbine units would have as subdivisions the turbine, generator, condenser and condenser auxiliaries. The maintenance costs for the condenser auxiliaries would be further subdivided to cover each piece of apparatus in that group.

An operating record, the turbine room log sheet (Fig. 1), is kept on the turbine unit and shows the hours operated and whether the unit was out of service, available or undergoing repairs. Records and maintenance costs for the boiler units are kept in the same way. The boiler-unit records are further subdivided into boiler, furnace and stoker, and the furnace repairs are again subdivided to cover front wall, bridge wall, right and left side walls.

Boiler operating records are also kept covering the hours of steaming (Fig. 2), the banked time and the number of hours out of service while repairs were being made to either the boiler, furnace or stoker. This record also shows the number of pounds of steam generated daily by the boiler, the number of pounds of coal burned, the steam and flue-gas temperatures, the percentage of $CO_2$ and the boiler efficiency. This is a cumulative record which gives the totals and averages for any date in the month, together with a total and average at the end of the month. The yearly records are kept in the same way by monthly periods. This information is especially valuable when comparing the operation and maintenance costs of one boiler unit with those of another.

### CARD FILE CONTROLS INSPECTION DATE

Inspections are handled in the following manner: A calendar card file has been prepared which has a space for each day of the year. The file is further separated into months with divisions for each day of the month for convenience in finding dates. The dividers for the months are of different color from those for the days. Then a typewritten inspection card (Fig. 3), 4 in. x 6 in., is kept for each unit in the station and the subdivisions of that unit. This card is headed with the name and number of the unit, and it states what the inspection is to consist of and how frequently inspections are to be made. As these dates are reached the inspection cards are withdrawn from the file and work orders (Fig. 4) are issued to the foreman in charge of the repair force. These work orders state what is to be done, when the work is to be started and when it is to be completed. The inspection cards are then returned to the file and set ahead to the date when the next inspection is required.

A carbon copy of all work orders issued is kept in the chief engineer's office and checked off when the original is returned. When the inspection or work covered by the work order is completed, the foreman turns the original into the office and places on it the name of the workmen together with the number of hours each man worked. To keep in touch with the work covered by work orders, the carbon copy is used to follow up on the original order if the work is not completed on schedule time. The copies are checked over daily, and if for any reason the foreman has failed to complete the work or has forgotten to turn the work order in on the date given him on his work order to complete that work, the copy of this order is handed to the chief engineer. He in turn gets in touch with the foreman in charge of the work and finds out the reason for the delay.

### WORK ORDERS ISSUED ON ELECTRICAL INSPECTION

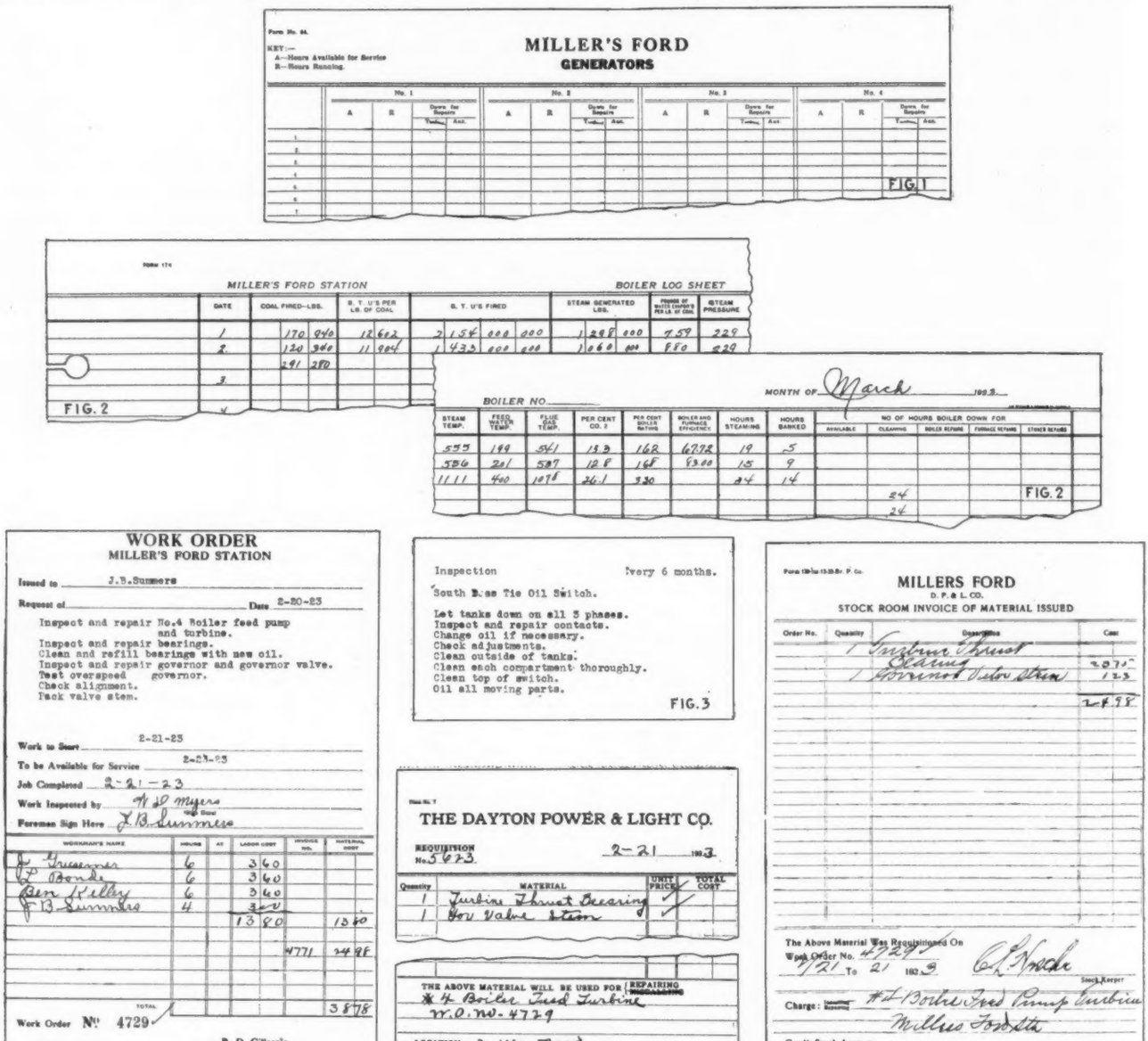
The inspection and maintenance of the electrical equipment, such as oil circuit breakers, motors and transformers, are also taken care of by work orders in the regular way. The oil circuit breakers are inspected at regular intervals. The switch contacts are inspected and repaired if necessary, the oil filtered and a breakdown test given to it. All adjustments are checked, after which the switch is opened and closed a few times to see that it functions properly. An operating record is also kept of all the oil circuit breakers that open automatically, and if any opens automatically more than a given number of times because of short circuits or overloads the switch is taken out of service. The contacts are then repaired, the oil is filtered and tested, and the switch is restored to its normal condition, regardless of whether this falls in the regular routine or not.

At regular intervals a sample of oil is taken from each transformer and subjected to a breakdown test. If the test shows the oil to be deteriorated, it is run through an oil drying and filtering machine a sufficient number of times to restore it to its original condition. This method has been in use for the past three years, and during this time there have been no transformer failures due to deteriorated oil.

Motors are also inspected at regular intervals. The small motors on the governor control of the main turbines get just as regular attention as the large motors on the condenser circulating pumps. Boiler and furnace inspections are handled on special forms that outline a very thorough inspection. Work orders are issued to cover repairs that are shown by these reports to be necessary on the boiler, the furnace or the stoker.

Whenever material is required for making repairs, the foreman issues a requisition (Fig. 5) on the storeroom with the work-order number on the requisition for the material. From this requisition the storeroom man issues an invoice (Fig. 6) covering the material

issued, giving the distribution and the work-order number. This is sent to the office, where the cost of the material is put on the invoice numbered and filed. The cost of the material, the invoice number and the labor costs are then transferred to the original work order. The work order is now complete and gives the total cost of the job in labor and material. It also is always carried on the same page number; that is, when a sheet is full it is withdrawn from the book, numbered and then filed. A new sheet is then inserted, having the same page number but with the next higher sheet number. Labor costs are entered daily in the labor distributing book direct from the workman's time card. Material costs are taken from the purchase




RECORD FORMS THAT FACILITATE INSPECTION AND MAINTENANCE

Fig. 1—Turbine log sheet, giving hours of operation for both turbine and auxiliaries.

Fig. 2—Boiler-room log sheet has space for complete data on boiler operation.

Fig. 3—Typical inspection cards determine date of overhauling besides giving specific instructions for necessary inspection.

Fig. 4—The work order authorizing repair of inspection work also contains the itemized costs of labor and materials.

Fig. 5—The requisition for stock issued by the foreman against the storeroom.

Fig. 6—The stock-room invoice record lists the cost of the materials which have been issued.

indicates when the job was started, when completed, the number and names of men working on the job and the foreman in charge of the work. The work order is then filed under the proper heading in a file provided for that purpose. Work orders are used for all work other than routine work in the station and machine shop.

Maintenance costs are entered in two loose-leaf books having ten ruled column pages, one book being for distributing labor costs and the other book for distributing material costs. For convenience the same account orders and from the storeroom invoices. The distribution books are totaled at the end of each month so that the results make up the monthly maintenance-of-equipment cost sheet, which in turn becomes a part of the monthly manufacturing-cost statement. The monthly totals are then carried to the summary book, which has a column for each unit for labor, material and total cost by months. This book also shows at any time the cost of maintaining any one unit or its subdivision for any given period desired.

# Uniformity in Demand Rates*

## Diversity of Form and Application Makes Standardization Desirable—Characteristics of Meters, Load and Duration of Peaks Have Marked Effect on Registered Demand — Comparison of Time Intervals

By W. M. CARPENTER
*Engineer Empire State Gas & Electric Association, New York City*

METHODS of measuring demand in electric rates show a great diversity in form and application among central-station companies and in an effort to bring about a greater uniformity of practice the Empire State Gas and Electric Association last year formed a committee to investigate the possibilities of standardization. Although this committee is not yet ready to report or make recommendations, it has nevertheless developed a great deal of interesting information and much valuable data. The work of the committee has been directed principally at the general proposition of the measurement and rating of demand rather than the technical features of the meters themselves.

The course of procedure followed by the investigation has included:

First—A tabulation of all demand rates now in effect throughout the state.

Second—A questionnaire to a group of the larger companies, containing the following inquiries:

1. Should the demand charge be stated in the rate as a yearly or a monthly charge?
2. Should the demand charge be based on the yearly peak, or should each month's or each week's bills be based on the monthly or on the weekly peak?
3. If the charge is based on the yearly peak, what constitutes the year; *i.e.*, is the calendar year or the contract year to be used as the basis?
4. What time periods should be used as the basis of demand charge for different situations; *i.e.*, when, for example, should a one-minute, a five-minute, a fifteen-minute or a thirty-minute peak be used?

Third—A collection of typical load curves for industrial plants, in order to discover, if possible, the load characteristics of the various industries.

Fourth—A survey of the metering devices now on the market.

At this point it should be noted that the influence of power factor has not been considered at all, and that the handling of this particular phase of the question has been reserved for a future study.

During the investigation it was found that there is a great diversity in the methods employed by the various companies in connection with their demand rates. There are on file in Albany and New York over one hundred rates, of which hardly five are alike. The time interval varies from an "instantaneous" reading to one hour. Some companies carry the demand, once established, over a period of an entire year; others carry it for a month; a few special cases are for a week only. Some companies, in a happy uncertainty, do not define "demand" at all; others compute it, not from the readings of recording or indicating instruments, but as a percentage of the connected load, and here also there is a wide range of practice.

Due consideration should be given to the fact that the situation must be viewed both from the engineering and from the commercial standpoints. It is a problem which interests equally the commercial, the meter and the engineering departments of the power company. Much of the business affected by demand rates is

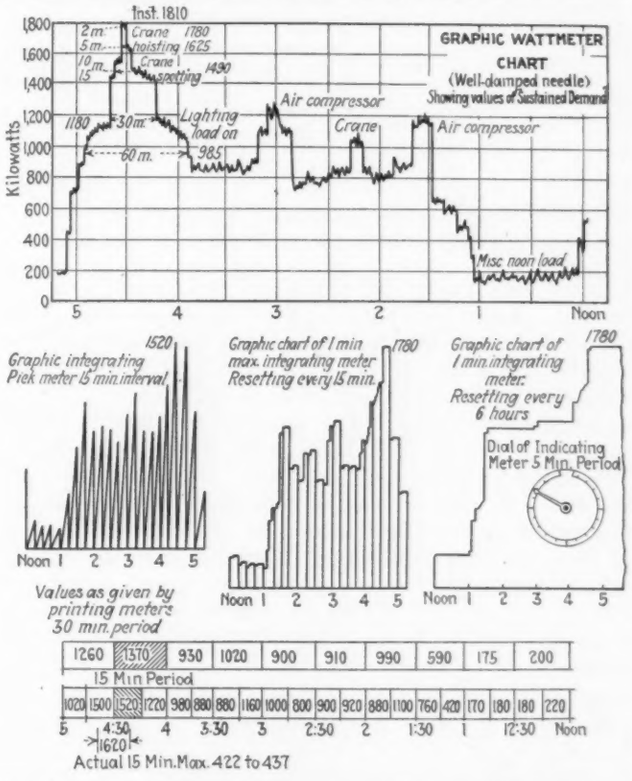



FIG. 1—TYPICAL LOAD, FOUNDRY WITH CRANE, SHOWING VALUES OF DEMAND AS DETERMINED BY VARIOUS METHODS

obtained in competition with private plants. The manufacturer always has steam boilers in his factory, and it is not such an enormous step to increase his equipment a little and install an electric plant in addition. If the manufacturer thinks that he can make electricity more cheaply himself, he certainly will do so. The scores of isolated manufacturing power plants within the limits of the larger cities of the state bear abundant witness to this fact. The large consumer, usually having at least a boiler house, sometimes even generating machinery of his own, is often in a position of considerable independence and can bring this additional factor to bear upon the question.

For this reason the purely engineering considerations

*From a paper presented at the winter meeting of the Electric Meter Section, Empire State Gas and Electric Association, at Syracuse, N. Y., Jan. 22, 1923.

are often modified so as to obtain a piece of business for which special provisions must be made.

The fundamental difficulty of the whole subject appears to center in the time interval, and while many arguments have been submitted in favor of each particular unit of measurement, the great majority of rates are based on questions of policy rather than upon scientific or engineering facts. The entire question is influenced by broad considerations of rate making, but it is desirable to note what great difference in the size of the customer's bill will be caused by various methods of measurement.

Fig. 1 represents the graphic wattmeter chart of a typical afternoon's work of an iron foundry. In the load there are included, besides the usual tumbling barrels and miscellaneous machinery, a 250-hp. air compressor and an electrically driven crane. When all these happen to operate at once at a time when the evening lighting load is also on, a peak of considerable size is formed. From this chart it is easy to determine how the various time intervals will affect the amount of the so-called demand. If the "sustained" peak is used as the basis of measurement, the demand found will be lower than that where the "integrated" peak is used and the unit price will have to be raised accordingly. The sustained peak may be defined as that portion of the curve during which the indication remains at its highest value for the duration of the required period of time. While the use of this quantity—in that it cannot exceed the true maximum integrated demand—will usually meet with the customer's entire approval, it is very unfair to the electric company because the value cannot be higher than the minimum point of any depression which may occur during the period. In addition, the depth of the instantaneous minimum as drawn by graphic instruments depends largely upon the amount by which the meter movement is damped. It is also possible for unscrupulous customers to install artificial interrupting devices which will cut off the current long enough to let the meter needle drop and then pick it up again.

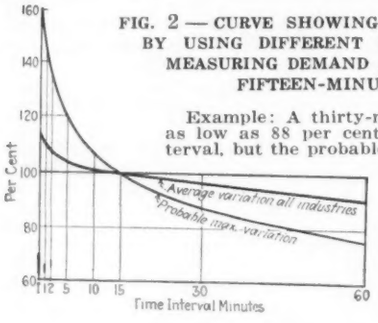



FIG. 2 — CURVE SHOWING VARIATION OF RESULTS BY USING DIFFERENT TIME INTERVALS FOR MEASURING DEMAND AS COMPARED WITH FIFTEEN-MINUTE INTERVAL

Example: A thirty-minute interval may show as low as 88 per cent of the fifteen-minute interval, but the probable average of all industries will be 97 per cent of the fifteen-minute reading. An instantaneous interval may be as much as 160 per cent of the fifteen-minute period, but the probable average of all industries will be 116 per cent of the fifteen-minute values.

From the chart it is evident that a sixty-minute sustained demand will only show 985 kw., while a fifteen-minute period will give 1,400 kw. and a two-minute one will give 1,780 kw.

Similar—though not so extreme—differences are shown by various methods of integration, which give either the actual total or else the average kilowatts used in any period of time. To the left below the wattmeter chart is shown how the curve might look on a graphic integrating meter of the "Piek" type, which resets on a fifteen-minute period. This would show 1,520 kw. A one-minute maximum integrating meter would show 1,780 kw., while a five-minute period would give 1,670 kw.

In the same way the readings given by the various printing meters, or "printometers," would show wide divergences. A thirty-minute period would give 1,370 kw. between 4 p.m. and 4:30 p.m. A fifteen-minute period would show 1,520 kw. between 4:15 p.m. and 4:30 p.m. In these meters there is an added disadvantage that because the time periods are selected by a clock no cognizance is taken of load conditions immediately before or after the interval. Thus, in this particular case, if the clock were seven minutes slow, it would show the real peak from 4:22 p.m. to 4:37 p.m. at 1,620 kw.

Numerous attempts have been made to develop a meter which will overcome this selective characteristic, but as yet they have not found sufficient favor to justify their widespread operation.

A type which has found much use is the so-called "lagged" type, which is really an indicating meter in which a retarding device is used so that some definite period must elapse before the full value is indicated. This retarding device may be either mechanical or thermal, and the time interval is independent of any clock. In all of these, however, the demands shown will differ by an amount which depends upon the particular type of instrument and upon the character of the load curve. With a nearly steady load all instruments of this class will show nearly the same value as the integrating meters and give a very close approximation of the actual demand, but with a fluctuating load each type will give a different result.

This brings us to the second phase of the problem, namely, the effect of the characteristic load curve of the industry upon the size and duration of the peak. Industries vary widely in the manner in which they use electricity. In some limited instances, such as flour mills, electro-chemical industries and an occasional pumping plant, the curve is so regular as to make all considerations of the length of the peak unnecessary. In all others, however, a more or less irregular use of energy is necessary, and as the plant operations become more and more irregular and tend more and more toward the use of heavy machinery, some differences between the peak and the average use becomes inevitable. This is particularly true of heavy, concentrated work, such as is found in rolling mills and stone crushers and in all processes where there are sudden heavy loads, poorly compensated for by insufficient flywheel capacity.

To investigate this, there were collected the graphic wattmeter charts of forty typical industries, selected at random as showing an ordinary day's work and not supposed to represent either the maximum day or the maximum peak. From these the peaks were selected and a tabulation was made up showing the relation of the values found by using the various time intervals. The results of this tabulation showed that:

(*a*) The "sustained demand" as the basis of measurement bears very little relation to the real demand.

(*b*) As a general rule, the shorter the length of the time interval the lower should be the unit price per unit of demand.

(*c*) The sixty-minute peak rarely represents the use of electricity except in the case of two or three industries with exceptionally steady load characteristics.

(*d*) The "maximum momentary demand" is largely dependent upon the damping of the needle of the meter.

(*e*) It appears to be a matter of great difficulty to find a combination of equitable time interval and a suitable meter which will show the demand of all the industries of a community with absolute accuracy. Apparently the fifteen-minute peak comes as near as may

reasonably be expected to representing the actual demand. It was found that the results from two-minute peaks were seldom more than 10 per cent above and those from thirty-minute peaks more than 5 per cent below the results arrived at by using a fifteen-minute interval.

It is evident that the selection of the measuring devices should follow rather than precede the assignment of the time interval. It appears, however, that in a great many cases, particularly among the smaller electrical companies, this procedure has been reversed. Central stations in many instances have adopted a particular type of meter and then have tried to apply a particular rate for this meter.

In conclusion, it must always be remembered that the actual measurement of demand is still in the development stage, and that there is yet a vast field ahead of it. This is especially true in regard to the phase which we all approach with fear and trepidation—the influence of the power factor. It is expected that the recent great progress which has been made in the development of the kilovolt-ampere meter will lead to the determination of true electrical demand without recourse to all the mathematical gymnastics which are now necessary where the element of power factor enters into the bill.

It is expected that the committee which has this problem in charge will develop a set of standards which will more nearly co-ordinate the present great diversity of practice which exists in this field.

# Electric Drive Found Best for Ice Plants*

## Its Use Almost Universal in New York City—Less Skilled Attendance Required than with Other Methods—Comparative Production Costs with Various Kinds of Driving Equipment

By J. R. McCOY
*Assistant Commercial Manager Texas Power & Light Company*

WHEN power can be obtained at a rate which compares favorably with the fuel costs prevailing in a particular locality, the motor-driven plant is the wise selection, and so the average buyer concludes, provided that the supply of such power is reliable. That is a very important factor and one which must enter into the buyer's consideration when he is ready to make his choice.

One factor, of course, always predominates in the matter of selecting a prime mover for an ice-making plant and that is the quality of water available for making fresh-water ice. One does not think any longer in terms of distilled water unless the water supply for the purpose of making ice is strictly unsuitable for the production of a clear, attractive-looking block. In that event a plain distilled-water plant is the only resort. Expensive combinations, such as multiple-effect evaporators, have been tried out, producing distilled water on an economical basis with coal and driving the ammonia compressors by another source of power; but it has almost invariably proved to be a fact that the first cost of this complicated equipment and its high maintenance cost, particularly that of the evaporators, makes it far from a good plan for plain commercial ice manufacture.

This discussion and the comparisons made are concentrated on the fresh-water plant, since that type of plant unquestionably predominates today and should be of greatest interest to the man now in the ice business or the man who contemplates entering it. Not many years ago, even since the development of an efficient fresh-water system, one plant was installed in New York in which the compressors were driven by the uniflow engines and the auxiliary power supplied from a uniflow engine-driven electric unit. That plant made continuously an average of 18 tons of ice per ton of coal, using steam at 165 lb., 150 deg. superheat, and condensing at a 25-in. to 26-in. vacuum. Water supply was from deep wells at about 55 deg. Despite this individual case of economical performance, however, every plant that is started in the city of New York today is a fresh-water motor-driven plant.

The conditions which prevail in the larger cities and centers as to the source of power supply are not always prevalent in newer or less concentrated communities. Therefore there may be reason for the selection of prime movers other than electric motors in many localities until they become modernized as to the source and cost of electric power supply. The time, however, is almost bound to come when virtually every ice plant will be motor-driven.

### RELATIONS OF ELECTRIC AND OTHER FORMS OF POWER

An examination of the relation which electric power and fuel costs bear to the over-all costs of manufacture—namely, operating costs plus fixed charges—is important. Assume, as a practical layout, a 100-ton modern fresh-water ice plant, using cooling-tower water, 1,600 300-lb ice cans in two tanks, about 35,000 ft. of 1¼-in. pipe, with all modern appurtenances for multiple can harvesting and automatic can filling at the dump, operating over a period of eleven months on a 10,000-ton season storage with a year's production of 32,000 tons of ice. The results ascertained by analysis from a plant of this size with various types of prime movers ought to give the answer. The selection of prime movers would involve a consideration of the following:

1. Motor-driven plant, using two ammonia-compressor units, synchronous-motor-driven, direct-connected; all motor-driven auxiliaries.
2. Uniflow engine-driven plant using two compressor units, each direct-connected to uniflow engine, and a uniflow engine-driven generator of sufficient size for driving all auxiliaries by motor; water-tube boilers, 165 lb. steam pressure, 150 deg. superheat, with modern superheaters, economizers, motor-driven boiler-feed pumps, etc., engines operating condensing.
3. Oil-engine-driven plant using two ammonia-compressor units, each belted to full Diesel-type Busch-Sulzer, or equal,

*From a paper presented at the Southwest Geographic Division, N. E. L. A., convention at Oklahoma City, March 14-16, 1923.

oil engine, and one oil-engine-driven generator set of sufficient size for driving all auxiliaries by motors.

4. Oil-engine-driven plant using less expensive oil engines of the semi-Diesel type, Fairbanks-Morse, Worthington, or equal, using two compressor units, each belted to an oil engine, and one oil-engine-driven generator set of sufficient size to drive all auxiliaries by motor.

In each case two ammonia compressor units are considered. That is done, first, to secure a better load factor and, second, to reduce the hazard of interruption. It would hardly be fair to make comparisons based on two units in one case and a larger unit in another case.

There are many other points of advantage to warrant the selection of two compressors, each individually driven, rather than a large single unit. The two compressors need not necessarily be of equal size, but nevertheless there should be two. The power and fuel costs are assumed to be as follows:

Electrical energy at 1.5 cents per kilowatt-hour average for the year, taking into consideration load factors, maximum-demand charge, etc.

Coal at $4.50 per ton, delivered to boiler room in bunkers or otherwise.

Fuel oil at 5 cents per gallon for oil-engine-driven purposes, delivered and placed in tanks at plant.

It is not expected that these three unit costs of power and fuel will simultaneously exist in any one particular point in the country. It is realized that at some points the cost of coal is almost prohibitive while at these same points fuel oil may be very cheap. The same thing might apply to electric power in certain localities where this particular combination exists, and such points represent the average between the oil fields and coal fields. Substitutions can be readily made in the accompanying analysis table for any other fuel or power costs.

### COMPARATIVE MANUFACTURING COSTS

The manufacturing cost per ton of ice, which includes operating costs and fixed charges, is as follows:

| | Per Ton |
|---|---|
| Motor-driven plant | $2.17 |
| Uniflow steam-engine-driven plant | 2.34 |
| Full Diesel oil-engine-driven plant | 2.32 |
| Semi-Diesel oil-engine-driven plant | 2.38 |

As between the last two plants an increase of 6 cents per ton will be noted when the cheaper engine is used. That difference is accounted for by higher fuel-oil consumption and particularly by higher lubricating-oil and maintenance cost. The full Diesel-type engine has a much more scientific and efficient lubricating system, everything being force-feed and eliminating splash with consequent evaporization. Moreover, the full Diesel type works under higher pressures and temperatures and is designed and built to operate more economically on fuel oil.

The interesting feature of the accompanying tabulations is the fuel or power cost per year as compared with the total manufacturing cost. As mentioned above fuel costs are often compared without due consideration of much else that enters into the cost of ice. The following will indicate why purchasers are misled in many instances.

### REASONS FOR LOWER ELECTRIC COSTS

With the motor-driven plant 30 per cent of the total manufacturing cost is for power bills, and yet, according to the tabulation, ice can be made therewith for the least money. First of all, the total investment in the plant is lower, which cuts down the fixed charges. Second, the labor requirements in that plant are less by reason of its simplicity. Third, the upkeep or maintenance cost is bound to be less. Fourth, the type of engineering skill that is, of necessity, needed in a steam or oil-engine-driven plant is not required in a motor-driven plant. Therefore a chief engineer can be engaged at a smaller salary.

The fixed charges, of course, represent the greatest difference and are the charges that are often overlooked or underestimated. In the case of the uniflow-engine-driven plant and oil-engine-driven plants the fuel cost runs from 11.9 per cent to 14.7 per cent of the manufacturing cost, which shows that the power cost in the motor plant is virtually two and one-half times

PERCENTAGE OF POWER OR FUEL TO TOTAL MANUFACTURING COST

| Type of Plant | Total Yearly Manufacturing Cost | Yearly Power and Fuel Cost | Per Cent Ratio of Power or Fuel Cost to Total Manufacturing Cost |
|---|---|---|---|
| Motor-driven | $69,630.00 | $22,100.00 | 32.0 |
| Uniflow steam-engine-driven | 74,932.00 | 9,300.00 | 12.5 |
| Full Diesel oil-engine-driven | 74,362.00 | 8,800.00 | 11.9 |
| Semi-Diesel oil-engine-driven | 76,294.00 | 11,160.00 | 14.7 |

the average cost required with coal or fuel oil; but in the steam plant and oil-engine-driven plants the investment makes the fixed charges soar and the maintenance is bound to be higher. More and better skilled labor is required. Besides, there is more likelihood of service interruption with oil-engine-driven plants than with motors operated from central-station service.

This statement is not intended to be detrimental to the oil-engine builder, but it remains a fact that a high-speed reciprocating unit working under high temperatures and at a continuous full load is much more subject to breakdown than a motor-driven installation. It does not take a very long shutdown in a 100-ton ice plant to curtail the earnings seriously and cause a loss which would probably offset any gain that the owner hoped to reap by the selection of a particular prime mover.

With the steam-engine-driven plant, which makes ice cost $2.32 per ton, 1.86 cents per kilowatt-hour could be spent for power; in the full Diesel oil-engine plant, in which the ice costs $2.32 per ton, 1.83 cents per kilowatt-hour could be spent for power. These figures do not take into account the relative hazard of service interruption, which must necessarily have consideration.

A motor is the only prime mover that really operates at a constant efficiency with a minimum amount of attention. A uniflow-engine-driven or oil-engine-driven plant must be kept in top-notch condition if it is to produce maximum rating at maximum economy under practically full-load conditions throughout a period of eleven months. That requres a top-notch chief engineer who has his heart in the plant—a type of man not always available.

## Bombay Electrification to Proceed

FROM Bombay Assistant United States Commissioner C. B. Spofford reports that announcement has been made by the Great Indian Peninsula Railway of sanctions to proceed with the first 30 miles of the Bombay suburban electrification scheme as far as Thana. Preparations are far advanced and contract will be placed at an early date for the first 20 miles of trackwork and special rolling stock.

# Forcing Most Economical Load Division by Reactors

## Investigation of Values on Boston System Leads to Decision to Install Reactors with Taps Permanently Built Into Reactor Structure — Limits Voltage Drop

By A. H. SWEETNAM
*Assistant Electrical Superintendent*
*Edison Electric Illuminating Company of Boston*

IN RECENT years many of the large central-station companies, owing to their abnormal growth and the resulting large concentration of generating capacity, have found themselves with oil circuit breakers of insufficient interrupting capacity. This condition in many cases has resulted in the application to transmission lines, buses and apparatus of current-limiting reactors. In articles which have appeared from time to time in the technical press, the subject has been treated chiefly from the viewpoint of limiting short-circuit current to a value which can safely be interrupted by the existing breaker installation. In some cases the application of reactors is made for this purpose alone, as experience has shown that in case of fault the bus pressure has been reduced to such a value that synchronous equipment will fall out of step.

TABLE I

External reactance in ohms required in No. 4/0 B. & S. gage cable (operating in parallel with 300,000-circ.-mil cable having 1-ohm external reactor) in order that cables may divide current and kilowatt load in accordance with the respective cross-sections.*

| Length in Miles | Total Reactance (Ohms) Inherent and External | Inherent Reactance (Ohms) | External Reactance (Ohms) |
|---|---|---|---|
| 1 | 1.670 | 0.188 | 1.482 |
| 2 | 1.922 | 0.376 | 1.546 |
| 3 | 2.174 | 0.564 | 1.610 |
| 4 | 2.427 | 0.752 | 1.675 |
| 5 | 2.679 | 0.940 | 1.739 |
| 6 | 2.931 | 1.128 | 1.803 |
| 7 | 3.184 | 1.316 | 1.868 |
| 8 | 3.436 | 1.504 | 1.932 |
| 9 | 3.688 | 1.692 | 1.996 |
| 10 | 3.941 | 1.880 | 2.061 |
| 11 | 4.193 | 2.068 | 2.125 |
| 12 | 4.445 | 2.256 | 2.189 |
| 13 | 4.698 | 2.444 | 2.254 |
| 14 | 4.950 | 2.632 | 2.318 |
| 15 | 5.202 | 2.820 | 2.382 |

*This table is prepared on the assumption of the use of three-conductor, 15,000-volt working-pressure cable (operating at a frequency of 60 cycles per second) having 7/32-in. insulation over each conductor. The formula used in the calculation is: External reactance in ohms for No. 4/0 = $1.4175\ (1+0.178N)-0.188N$, where $N$ = the length of cable in miles.

One application which appears very important has apparently not been treated. This is the use of reactors to apportion load between transmission lines of different cross-sections operated in parallel on the same substation bus. In such a case the current and hence the kilovolt-amperes divide inversely as the respective impedances, while the kilowatts divide inversely as the reactances of the lines.

A concrete case would be a No. 4/0 B. & S. gage and a 300,000-circ.mil three-conductor, 15,000-volt working pressure cable, each having $\frac{7}{32}$-in. paper insulation. The 60-cycle reactance per phase per mile of the No. 4/0 cable is approximately 0.188 ohm, and that of the 300,000-circ.mil cable is 0.178 ohm; hence the kilowatt load will divide approximately 50 per cent to each. The corresponding impedances are 0.334 ohm and 0.264 ohm, and the current will divide approximately 44 per cent and 56 per cent. The copper cross-sections are approximately in the ratio of 41 and 59 per cent. Assuming a load of 10,400 kw. and 80 per cent power factor, the current and kilowatt load would divide as follows:

No. 4/0:

$R = 0.275$ ohm; $X = 0.188$ ohm; $Z = 0.334$ ohm.

5,060 kw., 5,750 kw., 88 per cent power factor, 221 amp.

300,000-circ.mil:

$R = 0.194$ ohm; $X = 0.178$ ohm; $Z = 0.264$ ohm.

5,340 kw., 7,250 kva., 73.7 per cent power factor, 279 amp.

Resultant $X = 0.0914$ ohm. Resultant $Z = 0.147$ ohm.

From these figures it is evident that the smaller line carries more than its proportion of the load, and if the load were to be increased, the smaller line would become appreciably overloaded with full load on the larger line.

In order to utilize the full capacity of copper installed, it would be desirable to install reactors of such rating as would result in the total impedance of the lines being in the same ratio as the resistances. This would result in a division of both current and kilowatt load in accordance with the line cross-sections. However, the problem is complicated by the wide range in reactor sizes which must be installed, as shown in the following:

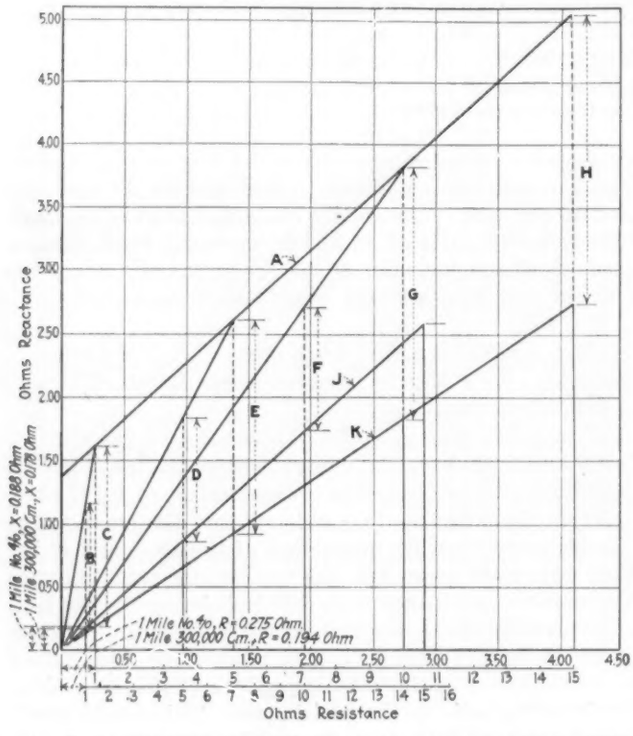
For the purpose of this study it may be assumed that in order to limit drop in bus voltage (due to line fault) to a value at which synchronous equipment will not fall out of step a minimum reactance of 1 ohm will be required. Such a reactor installed in a 300,000-circ.mil line a mile in length would result in a total impedance of 1.194 ohms. ($R = 0.194$ ohm; $X = 0.178 + 1.000 = 1.178$ ohms).

TABLE II

External reactance in ohms required in 300,000-circ.mil cable (operating in parallel with No. 4/0 B. & S. gage cable having 1-ohm external reactor) in order that cables may divide current and kilowatt load in accordance with the respective cross-sections.

| Length in Miles | Total Reactance (Ohms) Inherent and External | Inherent Reactance (Ohms) | External Reactance (Ohms) |
|---|---|---|---|
| 1 | 0.838 | 0.178 | 0.660 |
| 2 | 0.971 | 0.356 | 0.615 |
| 3 | 1.103 | 0.534 | 0.569 |
| 4 | 1.236 | 0.712 | 0.524 |
| 5 | 1.368 | 0.890 | 0.478 |
| 6 | 1.496 | 1.068 | 0.428 |
| 7 | 1.634 | 1.246 | 0.388 |
| 8 | 1.766 | 1.424 | 0.342 |
| 9 | 1.899 | 1.602 | 0.297 |
| 10 | 2.032 | 1.780 | 0.252 |
| 11 | 2.164 | 1.958 | 0.206 |
| 12 | 2.297 | 2.136 | 0.161 |
| 13 | 2.429 | 2.314 | 0.115 |
| 14 | 2.562 | 2.492 | 0.070 |
| 15 | 2.695 | 2.670 | 0.025 |
| 15.67 | 2.784 | 2.789 | ..... |

In order to have the total impedance in the same ratio to the 300,000-circ.mil line as the resistances the No. 4/0 line ($R = 0.275$ ohm, $X = 0.188$ ohm) would have a total impedance of $(0.275 \div 0.194) \times 1.194 = 1.692$ ohms, and a total reactance of $(0.275 \div 0.194) \times 1.178 = 1.670$ ohms, or an external reactance of $1.670 - 0.188 = 1.482$ ohms. If the length of line were to be 10 miles and the same size of reactor were installed in the 300,000-circ.mil line, the total impedance would become 3.39 ohms. ($R = 1.94$ ohms; $X = 1.78 + 1.00 = 2.78$ ohms.) The total impedance of the No. 4/0 line then must be $(2.75 \div 1.94) \times 3.39 = 4.81$ ohms and the total reactance $(2.75 \div 1.94 \times 2.78 = 3.94$, or an external reactance of $3.94 - 1.88 = 2.06$ ohms.




A—Total reactance required in No. 4/0 B. & S. line in order to divide current and kilowatt load with 300,000-circ.mil line (having 1-ohm external reactor) in accordance with respective cross-sections.

B—1-ohm external reactor in 300,000-circ.mil, 1-mile line; 1.482-ohm external reactor required in No. 4/0, 1-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

C—1-ohm external reactor in 300,000-circ.mil, 5-mile line.

D—1.739-ohm external reactor required in No. 4/0, 5-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

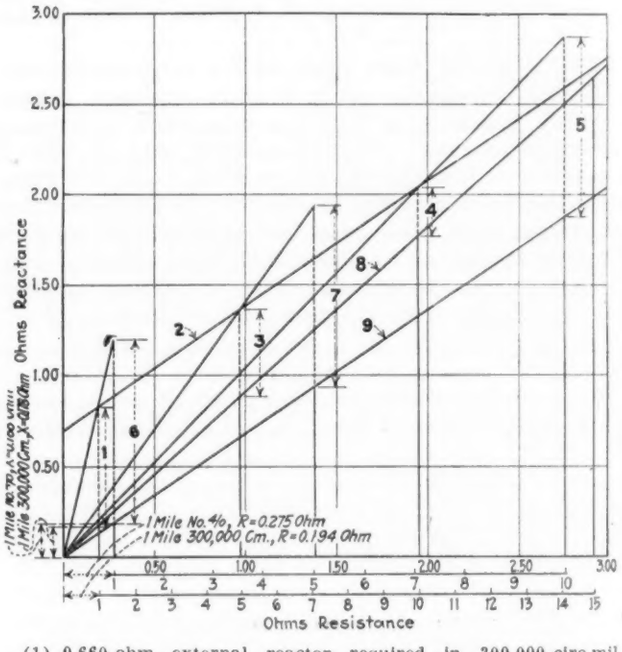
E—1-ohm external reactor in 300,000-circ.mil, 10-mile line.

F—2.061-ohm external reactor required in No. 4/0, 10-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

G—2.382-ohm external reactor required in No. 4/0, 15-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

H—300,000-circ.mil cable impedance.

I—No. 4/0 B. & S. cable impedance.




(1) 0.660-ohm external reactor required in 300,000-circ.mil, 1 mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

(2) Curve of total reactance required in 300,000-circ.mil line in order to divide current and kilowatt load with No. 4/0 line (having 1-ohm external reactor) in accordance with respective cross-sections.

(3) 0.479-ohm external reactor required in 300,000-circ.mil, 5-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

(4) 0.252-ohm external reactor required in 300,000-circ.mil, 10-mile line in order that lines may divide current and kilowatt load in accordance with cross-sections.

(5) 1-ohm external reactor in No. 4/0, 10-mile line.

(6) 1-ohm external reactor in No. 4/0, 1-mile line.

(7) 1-ohm external reactor in No. 4/0, 5-mile line.

(8) 300,000-circ.mil cable impedance.

(9) No. 4/0 B. & S. cable impedance.

**FIGS. 1 AND 2—RESISTANCE, REACTANCE AND IMPEDANCE OF NO. 4/0 B. & S. AND 300,000-CIRC.MIL LINES OF VARIOUS LENGTHS**

With 1-ohm external reactor in the 300,000 circ.mil line (for division of current and kilowatt load in accordance with respective cross-sections) the reactance required in the No. 4/0 line varies directly as the line length. (See Table I.) With the reactor in the No. 4/0 line the reactance required in the 300,000-circ.mil line varies inversely as the length. (See Table II.)

It becomes evident that with a fixed ohmic (external) reactor in a 300,000-circ.mil line the ohmic reactance required in the No. 4/0 line varies with the length of line. With lines 15 miles in length and with 1 ohm external reactance in the 300,000-circ.mil line the external reactor required in the No. 4/0 line becomes 2.38 ohms, or a 5.5 per cent reactor based on a rating of 200 amp. at 15,000 volts. The 1-ohm reactor assumed for the 300,000-circ.mil line based on 300 amp. at 15,000 volts is equivalent to approximately 3.5 per cent.

If reactors as shown in Table I were installed in the No. 4/0 line, the current and kilowatt load would divide in accordance with the cross-sections. The above condition is illustrated graphically in the accompanying illustration (Fig. 1).

In a similar way it can be shown that if the fixed size and rated reactor were to be installed in the No. 4/0 line, the reactor required in the 300,000-circ.mil line (in order to divide current and kilowatts in accordance with line cross-sections) would have a lower ohmic value than that of the fixed reactor and that this ohmic value would vary inversely as the length of the line. Calculations show that for a line 15.67 miles in length no reactor would be required in the 300,000-circ.mil line. Fig. 2 shows the above conditions in graphic form.

Assuming the same load conditions on lines ten miles in length and a 1-ohm reactor in each line, the current and kilowatt load would divide as follows:

No. 4/0:

$R = 2.75$ ohms; $X = 1.88 + 1 = 2.88$ ohms;

$Z = 3.98$ ohms.

5,106 kw., 5,977 kva., 85.43 per cent power factor, 230 amp.

300,000-circ.mil:

$R = 1.94$ ohms; $X = 1.78 + 1 = 2.78$ ohms;

$Z = 3.39$ ohms.

5,294 kw., 7.023 kva., 75.38 per cent power factor, 270 amp.

Resultant $X = 1.414$ ohms. Resultant $Z = 1.831$ ohms.

TABLE III—DIVISION OF KILOWATT, KILOVOLT-AMPERE AND AMPERE LOAD AND POWER FACTOR WITH 1 OHM EXTERNAL REACTOR IN EACH LINE

| Length of Line, Miles | No. 4 B. & S. | | | | | | 300,000 Circ.mil. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Kw. | Per Cent of Total Kw. | Kva. | Per Cent of Total Kva. | Amp. | Power Factor, Per Cent | Kw. | Per Cent of Total Kw. | Kva. | Per Cent of Total Kva. | Amp. | Power Factor Per Cent |
| 1 | 5,182 | 49.83 | 6,430 | 49.46 | 247 | 80.59 | 5,218 | 50.17 | 6,570 | 50.54 | 253 | 79.42 |
| 2 | 5,162 | 49.64 | 6,338 | 48.75 | 244 | 81.45 | 5,238 | 50.36 | 6,662 | 51.25 | 256 | 78.63 |
| 3 | 5,147 | 49.49 | 6,257 | 48.13 | 241 | 82.26 | 5,253 | 50.51 | 6,743 | 51.87 | 259 | 77.90 |
| 4 | 5,141 | 49.43 | 6,192 | 47.63 | 238 | 83.03 | 5,259 | 50.57 | 6,808 | 52.37 | 262 | 77.25 |
| 5 | 5,130 | 49.33 | 6,133 | 47.18 | 236 | 83.65 | 5,270 | 50.67 | 6,867 | 52.82 | 264 | 76.74 |
| 6 | 5,127 | 49.30 | 6,092 | 46.86 | 234 | 84.16 | 5,273 | 50.70 | 6,908 | 53.14 | 266 | 76.33 |
| 7 | 5,119 | 49.22 | 6,053 | 46.56 | 233 | 84.57 | 5,281 | 50.78 | 6,947 | 53.44 | 267 | 76.02 |
| 8 | 5,117 | 49.20 | 6,022 | 46.32 | 232 | 84.97 | 5,283 | 50.80 | 6,978 | 53.68 | 268 | 75.71 |
| 9 | 5,111 | 49.15 | 6,001 | 46.16 | 231 | 85.17 | 5,289 | 50.85 | 6,999 | 53.84 | 269 | 75.57 |
| 10 | 5,106 | 49.10 | 5,977 | 45.98 | 230 | 85.43 | 5,294 | 50.90 | 7,023 | 54.02 | 270 | 75.38 |
| 11 | 5,105 | 49.09 | 5,958 | 45.83 | 229 | 85.68 | 5,295 | 50.91 | 7,042 | 54.17 | 271 | 75.19 |
| 12 | 5,101 | 49.05 | 5,945 | 45.73 | 229 | 85.80 | 5,299 | 50.95 | 7,055 | 54.27 | 271 | 75.11 |
| 13 | 5,100 | 49.04 | 5,929 | 45.61 | 228 | 86.02 | 5,300 | 50.96 | 7,071 | 54.39 | 272 | 74.95 |
| 14 | 5,097 | 49.01 | 5,919 | 45.53 | 228 | 86.11 | 5,303 | 50.99 | 7,081 | 54.47 | 272 | 74.89 |
| 15 | 5,097 | 49.01 | 5,910 | 45.46 | 227 | 86.24 | 5,303 | 50.99 | 7,090 | 54.54 | 273 | 74.80 |

After the above study, the Edison Electric Illuminating Company of Boston, which found itself faced with this problem, decided to install reactors having taps permanently built into the reactor structure. The plan is to install these tapped reactors in No. 4/0 B. & S. gage lines which are required to operate in parallel with lines of 300,000-circ.mil cross-section, the purpose being to utilize the full cross-section of copper installed and also minimize copper losses.

Assume that two transmission lines operating in parallel, one of No. 4/0 B. & S. gage and the other of 300,000-circ.mil cross-section, to have been equipped with reactors, as above outlined; assume further that the No. 4/0 B. & S. gage line is to be looped in and out the premises of a new customer having a demand in the neighborhood of 1,000 kva., it becomes evident at once that this No. 4/0 line will reach full load in advance of the 300,000-circ.mil line.

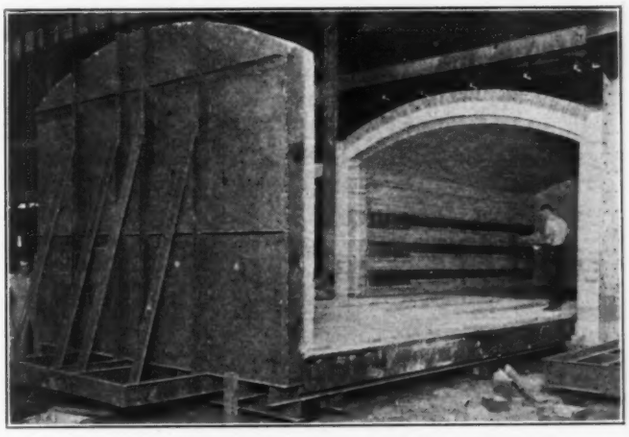
A further advantage of having this smaller line equipped with a reactor having taps is that they limit the current in the smaller line and increase the current in the larger line.

## Electric Furnace for Annealing Turbine Castings

THERE has been installed recently in the Schenectady plant of the General Electric Company an automatically controlled heat-treating furnace which is probably unique both in the matter of size and in the kind of work done. It is used for annealing large turbine castings, some weighing 85,000 lb., to relieve the internal strains left in castings, which would otherwise cause them to break or warp when machined.

The inside dimensions of the furnace are: Width, 15 ft. 10 in.; length, 27 ft. 7 in.; height, 8 ft. 7 in. The total connected load is 700 kw. at 550 volts, three-phase. The temperature maintained is 1,000 deg. F. The load is divided into two sections, 160 kw. being on the car top, which forms the floor of the furnace, and 540 kw. on the two side walls. The furnace is heated with General Electric ribbon resistor units. The door is mounted at one end of the car, the whole being pulled in or out to close or open the furnace.

In order to relieve the strains in a casting properly, it is necessary to have an exact uniformity of temperature in all parts of the furnace. By beginning the car top or floor heaters and the side-wall heaters with independent automatic temperature control a variation which tests have shown to be not greater than plus or minus 10 deg. has been obtained under operating conditions. The furnace has been a complete success, and up to the present there has not been a single case of a casting being rejected because of improper annealing. The great cost of these large castings made it imperative to install a furnace with absolute accurate temperature control.



ANNEALING FURNACE FOR 85,000-LB. CASTINGS

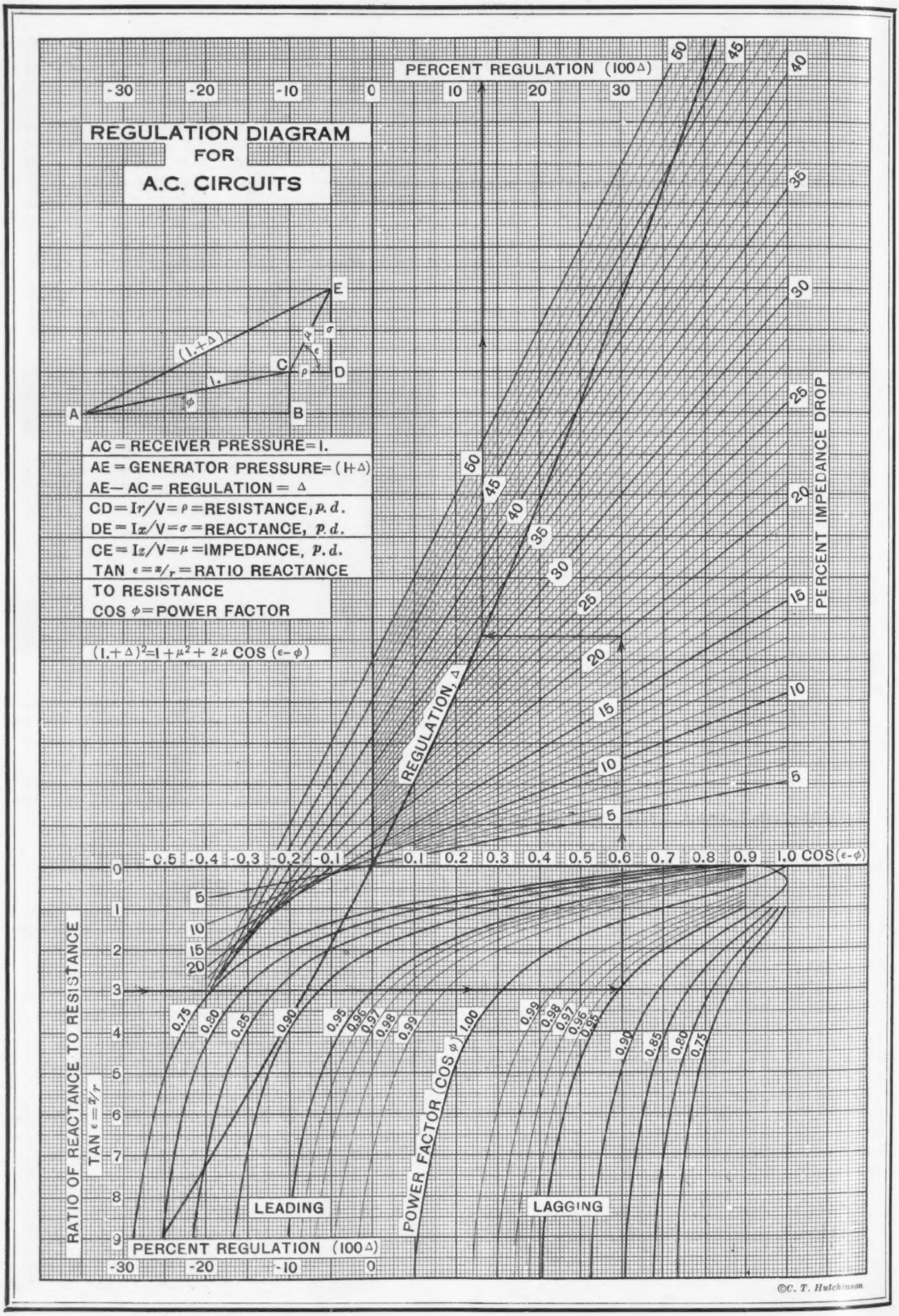
# Quick Calculation of Line Regulation

### Chart Which Permits Determination of the Characteristics that a Line Must Have to Meet Given Performance

BY CARY T. HUTCHINSON
Consulting Engineer, N. Y.

A NUMBER of diagrams for determining the regulation of alternating-current circuits are in use. Several of them, notably that of Baum, involve parts having relative motion; others, as the Mershon diagram, involve either the construction of the impedance triangle on the diagram or the use of a straight edge, as the Dwight. These are all somewhat intricate and do not lend themselves as readily as might be to the quick determination of regulation under different conditions.

The diagram on page 1466 gives the regulation for any circuit at any power factor, either lagging or leading, when the ratio of reactance to resistance, $x/r$, and the impedance pressure drop are known for any given circuit conditions. For explanation of chart see page 1467.


REGULATION DIAGRAM
FOR
A.C. CIRCUITS
PERCENT REGULATION (100Δ)
-30 -20 -10 0 10 20 30
AC = RECEIVER PRESSURE = 1.
AE = GENERATOR PRESSURE = (1+Δ)
AE − AC = REGULATION = Δ
CD = Ir/V = ρ = RESISTANCE, p.d.
DE = Ix/V = σ = REACTANCE, p.d.
CE = Iz/V = μ = IMPEDANCE, p.d.
TAN ε = x/r = RATIO REACTANCE TO RESISTANCE
COS φ = POWER FACTOR
(1+Δ)² = 1 + μ² + 2μ COS (ε−φ)
A B C D E
(1+Δ) 1. φ μ σ ε ρ
PERCENT IMPEDANCE DROP
REGULATION, Δ
-0.5 -0.4 -0.3 -0.2 -0.1 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 COS(ε−φ)
RATIO OF REACTANCE TO RESISTANCE
TAN ε = x/r
POWER FACTOR (COS φ)
LEADING
LAGGING
PERCENT REGULATION (100Δ)
-30 -20 -10 0
©C. T. Hutchinson

# Directions for Use of Chart Enabling Calculation of Line Regulation

Knowing the ratio of reactance to resistance and the impedance pressure drop, proceed as follows: Enter the diagram on the axis of $x/r = \tan \epsilon$ at the lower left edge of the diagram, at the given value of $x/r$, for instance, 3. Follow this ordinate to the right to the curve marked with the power factor of the circuit, e.g., 0.95; follow vertically upward to the diagonal line marked with the value of the impedance pressure drop, e.g., 20 per cent; follow horizontally to the intersection with the "regulation" curve. The regulation is the value of the abscissa of this curve given at the top of this sheet; in this case, 13.2 per cent.

**To determine the power factor required to give any particular regulation, proceed as follows:** Follow horizontally from the value of the regulation—e.g., 15 per cent—to the intersection with the locus of the impedance pressure drop, e.g., 25 per cent; follow vertically down to the intersection of that line with the value of $x/r$, e.g., 3. The point of intersection then lies on the power-factor curve, approximately 0.965.

**For zero regulation** the intersection of the axis of abscissas with the line for the value of impedance drop—e.g., 25—determines the point at which the vertical line to the value of $x/r$ shall be run. If $x/r = 3$, the intersection of this line with the vertical gives a leading power factor of 0.9; i.e., a circuit having a reactance ratio of 3 operated at leading power factor of 0.9 will be self-regulating if $\mu = 25$ per cent.

### Based on Vector-Triangle Solution

The diagram is based upon the solution of the ordinary vector triangle, as shown. It is accurate to the degree that the scale can be read. The value of $(1 + \Delta)^2$ is plotted in terms of cos $(\epsilon - \phi)$ for constant values of $\mu$, the impedance pressure drop. The equation giving the generator pressure is

$$(1 + \Delta)^2 = 1 + \mu^2 + 2\mu \cos (\epsilon - \phi).$$

This gives a family of straight lines for the series of values of $\mu$. The square root of the value of the ordinate, $(1 + \Delta)^2$, is given by the curve marked "regulation." Dropping unity, the value of $\Delta$, the "regulation," is read on the horizontal scale at the top of the diagram.

The first step in the use of the diagram is to find $r$, the resistance per mile, and $x$, the reactance per mile, from tables, or from the following formulas:

$r = 10^{-3} \times 5.6/N$, ohms per mile,

(at 60 cycle) $x = 0.11 + 0.28 \log D/d$, ohms per mile,

where $N$ = area of wire, circular-inches,

$D$ = distance apart of wires in inches,

$d$ = diameter of wire in inches.

The value of $x$ can readily be found by the slide rule.

The following approximation, not a very close one,

$$x/r = 12.5N,$$

will serve for transmission lines with spacing about 8 ft. to 10 ft. and conductors from No. 0 to 0.7 circ.-in.; this assumes $x$ to be constant over the range of sizes included.

For values of $x/r$ greater than 10, the limit of the diagram, 10 may be used with small error, inasmuch as the angle for $\tan \epsilon = 10$ is nearly 90 deg., and considerable differences in the value of $x/r$, when greater than 10, give small differences in cos $(\epsilon - \phi)$ and negligible differences in the regulation, as may readily be proved by trial.

The resistance pressure drop, $\rho$, is related to the power loss, $\lambda$, by the equation

$$\lambda \cos \phi = \rho$$

$\lambda$ may be one of the assumed data.

If the size of conductor is assumed, instead of the power loss, then $\rho$ may be found from the basic data of the problem.

Let $Q$ = apparent power delivered, in kva.,

$P$ = power delivered, in kw.,

$V$ = pressure delivered, in kv.,

$\cos \phi$ = power factor,

$L$ = distance, in miles,

$N$ = area of conductor, in circular inches,

$\lambda$ = power loss, in per cent/100,

$\rho$ = resistance pressure drop, in per cent/100.

Then,

$$Q \cos \phi = P$$

$$\lambda \cos \phi = \rho$$

and $$\rho N = 10^{-3} \times 5.6 \left(\frac{Q}{V}\right)\left(\frac{L}{V}\right).$$

This equation gives either $\rho$ or $N$, when the other is known.

Next, $\mu$, the impedance pressure drop, is determined from $\rho$, the resistance pressure drop, by the equation

$$\mu^2 = (1 + x/r^2)^2.$$

This value is readily found by slide rule. It is usually sufficient to take

$$\mu = \rho x/r;$$

that is, to take reactance equal to impedance, inasmuch as $x/r$ is usually greater than 3, for 60 cycles.

Having thus found $x/r$ and $\mu$, and cos $\phi$ being given, the regulation is taken directly from the diagram.

The foregoing discussion ignores line capacity. For pressures up to 66 kv. and distances up to 100 miles, the effect of charging current is practically negligible. For example, in that case the charging current would be about 20 amp. and 760 kva. per conductor. If the total apparent power transmitted is 22,800 kva., the charging current is equivalent to about 10 per cent of the line current. The effect of this on regulation can be found by first calculating the equivalent power factor, as follows:

Assume, $\cos \phi = 0.85$, $\sin \phi = 0.53$; the correction to sin $\phi$ on account of capacity is, $0.10/2 = 0.05$; hence

$\sin \phi' = (0.53 - 0.05) = 0.48$, and

$\cos \phi' = 0.88$.

If $x/r = 5.0$, and

$\mu = 30$, the diagram gives for

$\cos \phi = 0.85$, $\Delta = 22.0$ per cent;

$\cos \phi' = 0.88$, $\Delta' = 20.7$ per cent.

If the pressure is 132 kv., the charging current is doubled and

$\sin \phi' = (0.53 - 0.10) = 0.43$ per cent,

$\cos \phi'' = 0.90$ per cent

$\Delta' = 20.0$ per cent.

Even in this case—i.e., 45,600 kva., 100 miles at 132 kv.—the correction to the regulation is only 10 per cent.

### Refers to Line Regulation Only

The examples given here refer to the line only. The regulation should include the transformer drop as well; therefore, the ratio $x/r$ is not dependent upon the line alone; it is found by summing up the resistance drops and the reactance drops of transformers and line. As an example: Resistance pressure drop in each transformer, 0.75 per cent; reactance, 10 per cent; resistance pressure drop in line, 6.0 per cent; $x/r$ of line = 3. Then total resistance pressure drop = 7.5 per cent, total reactance pressure drop = $10 + 10 + (3 \times 6) = 38$, and $x/r$ for the circuit = $38/7.5 = 5.06$. Regulation is then fixed by $x/r = 5.06$, $\mu = 38$; for $\cos \phi = 0.9$, $\Delta = 36.5$ per cent.

### Examples that Illustrate the Use of the Diagram

| Data: | Results: |
|---|---|
| 1. $\cos \phi = 0.9$, $x/r = 5$, $\mu = 20$. | 1. $\Delta = 13$, $\rho = 4$, $\lambda = 4.4$, $N = 0.4$. |
| 2. $\cos \phi = 1.0$, $x/r = 5$, $\mu = 20$. | 2. $\Delta = 5.5$, $\rho = 4$, $\lambda = 4$, $N = 0.4$. |
| 3. $\cos (-\phi) = 0.85$, $x/r = 5$, $\mu = 20$. | 3. $\Delta = -5.5$, $\rho = 4$, $\lambda = 4.7$, $N = 0.4$. |
| 4. $x/r = 4$, $\mu = 20$, $\Delta = 10$. | 4. $\cos \phi = 0.98$, $\rho = 5$, $\lambda = 5.1$, $N = 0.32$. |
| 5. $x/r = 4$, $\mu = 20$, $\Delta = 0$. | 5. $\cos (-\phi) = 0.95$, $\rho = 5$, $\lambda = 5.3$, $N = 0.32$. |
| 6. $x/r = 3$, $\rho = 5$, $\Delta = 0$. | 6. $\cos (-\phi) = 0.92$, $\mu = 15$, $\lambda = 5.4$, $N = 0.24$. |
| 7. $P = 28{,}000$ kw. $\cos \phi = 0.85$, $L = 6.6$, $V = 66$, $N = 0.28$. | 7. $Q = 33{,}000$ kva., $\rho N = 10^{-3} \times 2.8$, $\rho = 10$, $x/r = 3.5$, $\mu = 35$, $\Delta = 28.3$, $\lambda = 11.8$. |
| 8. Same as (7) except $\cos \phi = 1.0$. | 8. $\rho = 8.5$, $\mu = 29.8$, $\Delta = 11.7$, $\lambda = 8.5$. |

In the above examples $N$ has been found by the approximate formula above; hence these results are applicable to transmission lines of approximately 8 ft. to 10 ft. spacing, as already stated.

# The Management of Suburban Districts

## An Outline of the Methods that Are Followed in the District Offices of the Detroit Edison Company—Line and Staff Organization—Billing, Collecting and Contact with Customers

By HERBERT SILVESTER
*District Agent the Detroit Edison Company, Ann Arbor, Mich.*

SALESROOM OF THE ANN ARBOR DISTRICT OFFICE, DETROIT EDISON COMPANY, WHICH FUNCTIONS FOR ALL DEPARTMENTS IN THE COMPANY'S RELATIONS WITH THE CUSTOMER AND THE PUBLIC

THE Detroit Edison Company furnishes electric light and power to an area with a radius of approximately 50 miles, surrounding Detroit on the north, west and south. In this area are thirteen incorporated cities and fifty villages. With the exception of five small hydro-electric plants along the Huron River and a steam turbo-generator plant at Marysville, the current is generated in Detroit and transmitted to the outlying districts.

Where possible the departments which function in the metropolis also operate in the suburban districts. That is, the operation of generating plants, substations and transmission lines, the maintenance and construction of overhead lines, general engineering and other work of like nature are directed and supervised by the appropriate Detroit departments, the entire area forming one operating district.

However, because of the necessity of maintaining an intimate contact with the customer, local organizations have been established for the purpose of handling all the relations between customers and the company. To this end nine commercial districts were formed, each in charge of a district agent who reports directly to the vice-president and sales manager. Each district has a complete staff, adequate for taking care of its own business activities, which include, in part, billing customers' accounts, reading meters, collections, applications for new service, connecting and disconnecting meters, selling electrical appliances, soliciting new business, complaints and adjustments and all other work of a commercial nature.

### "LINE AND STAFF" ORGANIZATION

It will be readily seen that the various departments which center at Detroit and reach out into the districts partake of a functional character, while the district organization is of the line or military type. The efficient features of a functional organization have been retained by allocating work of a technical or semi-technical nature to departments best organized to handle it. With one central control all construction and operating is done uniformly and standards are adhered to more rigidly than under nine separate operating units. It is also possible to have a staff of employees whose training is highly specialized in their particular work. But where directness of action is necessary, as in service to customers, the line type of organization in the commercial department is most effective.

The co-ordination of all departments must be smooth indeed to prevent any whipping at the loose ends. It

has been found feasible therefore to place in the field representatives of the Detroit operating departments who work closely with the district agents. The overhead-lines department is represented by a district foreman, who, through his inspectors and gang foreman, keeps closely in touch with the district agent. Orders for extensions and service drops are sent directly to this district foreman. In addition, all estimates for new business extensions are made at the district offices, thereby keeping in local control all matters which are of a local nature. It is essential also that each local office shall have complete and up-to-date reports of proposed line extensions and service drops. Jobs of this kind must, of course, be scheduled and the customers notified regarding the expected date of completion.

The department operating substations and transmission lines must at times interrupt service to customers. When these interruptions can be foreseen, the commercial department greatly assists both company and customer by conferring with the customers affected and then designating the time and period of interruption. In the matter of voltage regulation, the commercial department maintains recording voltmeters on every feeder for the purpose of recording voltage conditions on customers' premises.

As a number of separate municipalities, each with its own political organization and economic problems, are included in each district, it is essential that the company be directly represented by agents who have the support of the general management. Men trained in the company's policies and practices are assigned to this work. Complaints and adjustments are handled direct so as to afford the customer quick and efficient service.

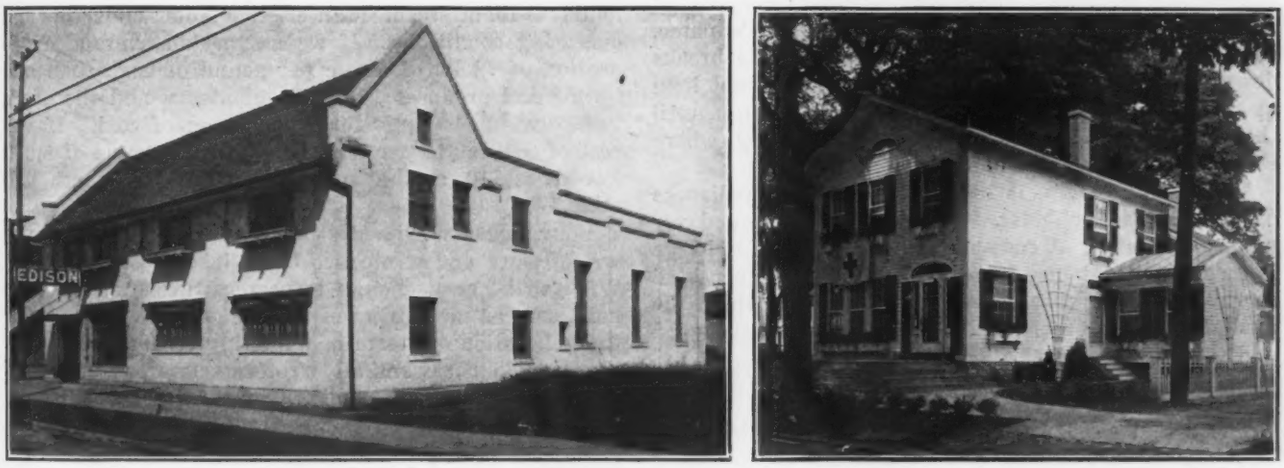
Uniformity of policy is also essential as the geographic boundaries are not always clearly marked and customers in one district must not be dealt with differently from those in other districts. To this end district agents' meetings are held bi-weekly in Detroit with the vice-president and sales manager presiding, at which time questions of policy and practice that may arise are thoroughly discussed.

The billing of customers is generally done at the local offices and on machines if the number of bills rendered from any one office justifies the overhead expense of this equipment. Where machines are used extra copies of the proof or trial-balance manifold sheets are made. The customers' ledgers are kept in a central office, and every local office is furnished with a sheet showing the details of accounts, thereby permitting quick reference in cases of inquiries regarding bills.

Generally, residence bills are rendered for two months' periods. Each district is divided into two areas and each area is billed on alternate months. By this means it is possible to read meters and render bills with a minimum of expense. Monthly reports showing total kilowatt-hours sold and total of the net bills rendered are sent to the general accountant at Detroit for posting to the general ledger. An analysis of earnings showing kilowatt-hours and net bills sold in each class of service is sent monthly to the statistician at Detroit.

### HANDLING COLLECTIONS

Every village and city has a local office where bills are payable, except in cases where the community is too small to justify the maintaining of an office. In this case an agency is established, generally at a local bank.




TWO OF THE DETROIT EDISON COMPANY'S DISTRICT OFFICES, LOCATED IN ROCHESTER (LEFT) AND MONROE, MICH. (RIGHT). BUILDINGS ARE DESIGNED OR SELECTED THAT ARE IN HARMONY WITH THE COMMUNITY AND THE LOCATION

Bills are delivered by hand in cities and villages and are mailed in rural areas. Customers receive the bills before the first of the month and are allowed ten days for payment with discount.

Soon after the discount day overdue statements are mailed. If no attention is paid to the mailed statement, a series of three follow-up letters is started, the last giving notice that the service must be disconnected for non-payment. The obvious follows. If no response is made to the last or "cut-off" letter, some one is sent to discontinue service, without further notice, unless payment is made when he calls. This collection routine is followed in all cases where customers have good records for payment, but if a customer is so negligent as to become a habitual delinquent only the overdue statement and "cut-off" letter are sent out.

Collection of bad debts is taken care of by the local organization, as its members are more intimately informed regarding conditions affecting the account. Sometimes extra pressure is advisable and a collector from Detroit is called in to make an effort to secure a settlement from a different angle. After all ordinary means of collection are exhausted, the unpaid bills are charged to "uncollectible" and the collection bureau in Detroit starts collecting through legal procedure.

All cash collected is deposited daily in a district depository bank. A duplicate deposit receipt is for-

warded to the auditor, who keeps a duplicate cash record. Withdrawals can be made only from the district depository banks by the company's treasurer or auditor.

Fuse calls are made during reasonable hours in villages and rural districts—that is, between 7 a.m. and 10 p.m. In cities of more than 25,000 population fifteen-hour trouble service is given. This work is done without charge to the customers. The repairmen locate the source of trouble, if possible remove it, and fuse the circuit. Where it is necessary to do more than make simple repairs the customer is requested to hire a wiring contractor. Repairs are made to domestic appliances and electric ranges. A complete line of washing-machine and vacuum-cleaner repair parts and replacement heating elements is carried.

Special attention is paid to quick servicing, as dead appliances earn no money for the company. If a customer is in the midst of her ironing and her electric flatiron burns out a "loan" iron is immediately sent her for use until her own iron can be repaired and returned. Service motors are also carried for washing machines and vacuum cleaners. These service motors are painted red, numbered and lettered with the company's name. If the motor on a customer's washing machine breaks down in the midst of a washing, the delay is not long as a service motor is installed and remains in use until the regular motor comes back from the factory, where it is sent for replacement or repairs.

This repair service is limited to domestic appliances of the lamp-socket class. Customers are charged for material required at cost plus 10 per cent. No charge is made for the labor, however, as this is compensated for by the energy used during the period in which the appliance would otherwise be laid up and by the good will thus created.

### CONTACT WITH CUSTOMERS

The actual sales work in smaller communities must be a matter of personal contact between the company and its customers. Soliciting new business is done informally through intimate service. Power installations are closely followed up to see that the customers are apprised of the most efficient methods of electric power applications, and should there be a need of expert engineering advice, this is obtained from the Detroit sales department. The same practice applies to large or unusual lighting installations. All new buildings are closely watched to see that the electric wiring is installed so as to be convenient and efficient.

The application of the company's practice and policy is direct and involves a close personal relationship between the customers and the utility. The district agent or his assistants are acquainted with all the merchants and manufacturers. Contacts are made at various social functions and over the tables of luncheon clubs. Complaints are not accompanied by the acrimony that is sometimes present when the large city customers complain. A series of formal letters gives way to informal conversation, and settlements are made by a satisfactory personal handling of the customer's difficulty. While the remedy is being applied the customer has an opportunity to learn in detail of the company's policies.

It will be readily seen that co-ordination of departments must be as real as it is possible to accomplish with human beings if the best results are to be obtained. This company has enjoyed unusual success in the working arrangements between departments, and credit must be given to the fine co-operative spirit which has been shown by the individual employees.

## Letters from Our Readers

**A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute**

### Kilowatt-Hour Rate of Two Mills Necessary to Make Electro-Steam Generation Profitable

*To the Editors of the* ELECTRICAL WORLD:

In the issue of the ELECTRICAL WORLD for June 9, 1923, on page 1374, in the article headed "A. S. M. E. Hears of Canada's Water Power," it is stated that "surplus water power was used for electric boilers in several plants, but that energy would have to sell at about two cents a kilowatt-hour before it could compete with ten-dollar coal for such purposes."

In reply to a question by John R. Freeman as to the value of electric power when utilized to produce steam, I stated that "one kilowatt-hour produces very approximately 3 lb. of steam in an electric boiler under normal operating conditions. If we assume an average evaporation of 7½ lb. of steam per pound of coal, then one ton of coal produces 15,000 lb. of steam, and therefore 5,000 kw.-hr. is equivalent to one ton of coal. If the cost of coal is $10 per ton, the equivalent value of 5,000 kw.-hr. is $10, so that one kilowatt-hour is worth two mills."

Your reporter evidently put his decimal point in the wrong place and wrote two cents instead of two mills. Will you be good enough to correct this error in your next issue as the subject of the use of electric power for the generation of steam is attracting so much attention that we do not want an erroneous impression to get abroad regarding the value of power for this purpose.

P. S. GREGORY,
Assistant to the Vice-President.
Shawinigan Water & Power Company,
Montreal, Canada.

### A Tribute to Louis Bell

*To the Editors of the* ELECTRICAL WORLD:

The passing of Dr. Louis Bell removes an engineer of surpassing abilities from the profession which he so greatly adorned, but more than this, it deprives a widening circle of friends of a man whose personal charm was very unusual. Few engineers were so gifted in the use of the mother tongue or so competent to make clear the complexities of physical science to readers of the technical press. Mingled with Dr. Bell's profound knowledge of electrical engineering and his specialized comprehension of the laws and methods of illumination and optics were a humorous understanding of men and an enthusiasm for social intercourse with his intellectual kindred that made him a delightful companion to those fortunate enough to know him. His writings for many years have enriched the literature of applied science. He combined great scientific ability with practical engineering judgment and was equally at home whether addressing the American Academy or a municipal street-lighting committee.

He gave his best to the work before him and inspired others to do likewise. He was always looking forward, and the passing years were but stepping stones to new achievement. Research and practice both called him to distinguished service, and his memory will long remain among those who had the privilege of his acquaintance.

HOWARD S. KNOWLTON.
Cambridge, Mass.

# Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

## Stripper Ram Repaired by Arc Welding

THE application of electric welding for repairing stripper rams should be of interest to steel-mill maintenance engineers. In the repair work considered below the ram was 10 in. in diameter and was broken off about 3 ft. from the lower end. With the ram lowered to the extreme limit the broken end was still between the tongs and only 20 in. below the housing of the ram. At the upper limit of travel the broken end would be well up in the housing.

COST OF WELDING STRIPPER RAM

| | | |
|---|---|---|
| New ram, 30 ft. long, 10 in. diameter | $200.00 | |
| Removing old ram and installing new ram | 100.00 | |
| | | $300.00 |
| Old method of welding | $500.00 | |
| Cost of preparation | 48.50 | |
| Cost of finishing | 5.00 | |
| | | $553.50 |
| Arc welding: | | |
| Welding labor and material | $200.00 | |
| Cost of preparation | 33.50 | |
| Cost of electric power | 6.00 | |
| Cost of finishing | 2.00 | |
| Total | | $241.50 |

Consequently this eliminated the possibility of leaving any reinforcement at the point of the break.

After analyzing the problem, a new tip for the ram was prepared from new steel stock, leaving the upper end of the piece cut off flat on the end at right angles with the axis of the piece. The stub end of the ram was then beveled off from two sides to form a blunt chisel end, the point for starting the cut for each face located above the end of the ram, a distance equal to the radius of the ram, in this instance 5 in. Each face was cut parallel with a plane through both of the tongs, so as to be easily available to the welder.

The new tip was then secured in place and proper alignment with the ram obtained by means of two bolts on opposite sides of the pieces, these bolts passing through two clamps, one secured near the upper end of the tip and the other secured to the ram just above the beveled faces. These bolts were inserted adjacent to the tongs, so as not to interfere with the welders.

The work was done during cold weather, and to make it possible for the welders to work continuously a platform about 8 ft. square was constructed at the correct height under the ram so that the welders could easily reach the surfaces to be welded. A housing and roof was constructed around this to protect the work and welders.

The total welding time was about eighteen man-hours, during which approximately 100 lb. of $\frac{1}{8}$-in. welding wire was used.

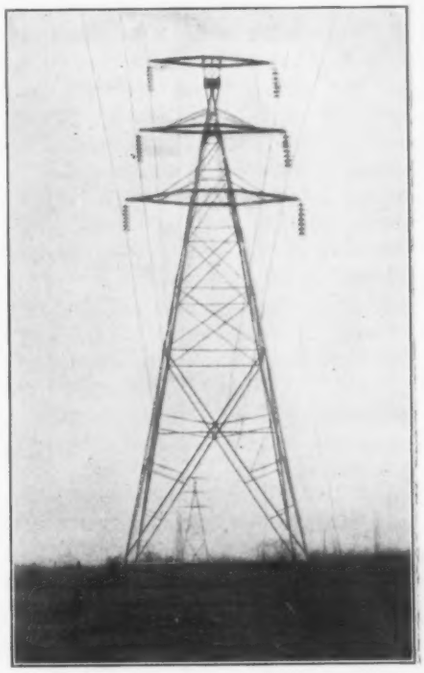
The alignment of the new tip with the main portion of the ram was almost perfect, and after grinding off the excess weld metal the ram could be drawn up into the stripper boom without any binding. This alignment was made possible by maintaining two welders at work at opposite sides, depositing an equal amount of metal on each side.

The cost of carrying out this work was much less than by the former methods, and the stripper was ready for service about twelve hours sooner. By examining the table of costs it appears that the cost of repairing a ram by the arc process shows only a slight saving over the cost of a new ram. However, the delay in obtaining a new ram would amount to several times this value, owing to the operators of the stripper being kept out of work.

A. M. CANDY,
General Engineering Department.
Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

## Transmission Power Line Reconstructed

DURING the past year the Niagara, Lockport & Ontario Power Company of Buffalo, N. Y., completed the reconstruction of a 60,000-volt, single-circuit, pin-type insulator steel-tower line to a double-circuit, 110,000-volt line. The reconstructed suspension tower is shown in the accompanying illustration. The original line was built in 1906 with 550-ft. spacing and 214,000-circ.mil full aluminum cable with 19-ft. sag and 30-ft. ground clearance. Through the use of aluminum cable, steel-reinforced, and pulling this cable to a sag of 10½ ft., it was possible to install two circuits and maintain a ground clearance of not less than 25 ft. The decreased sag, of course, required



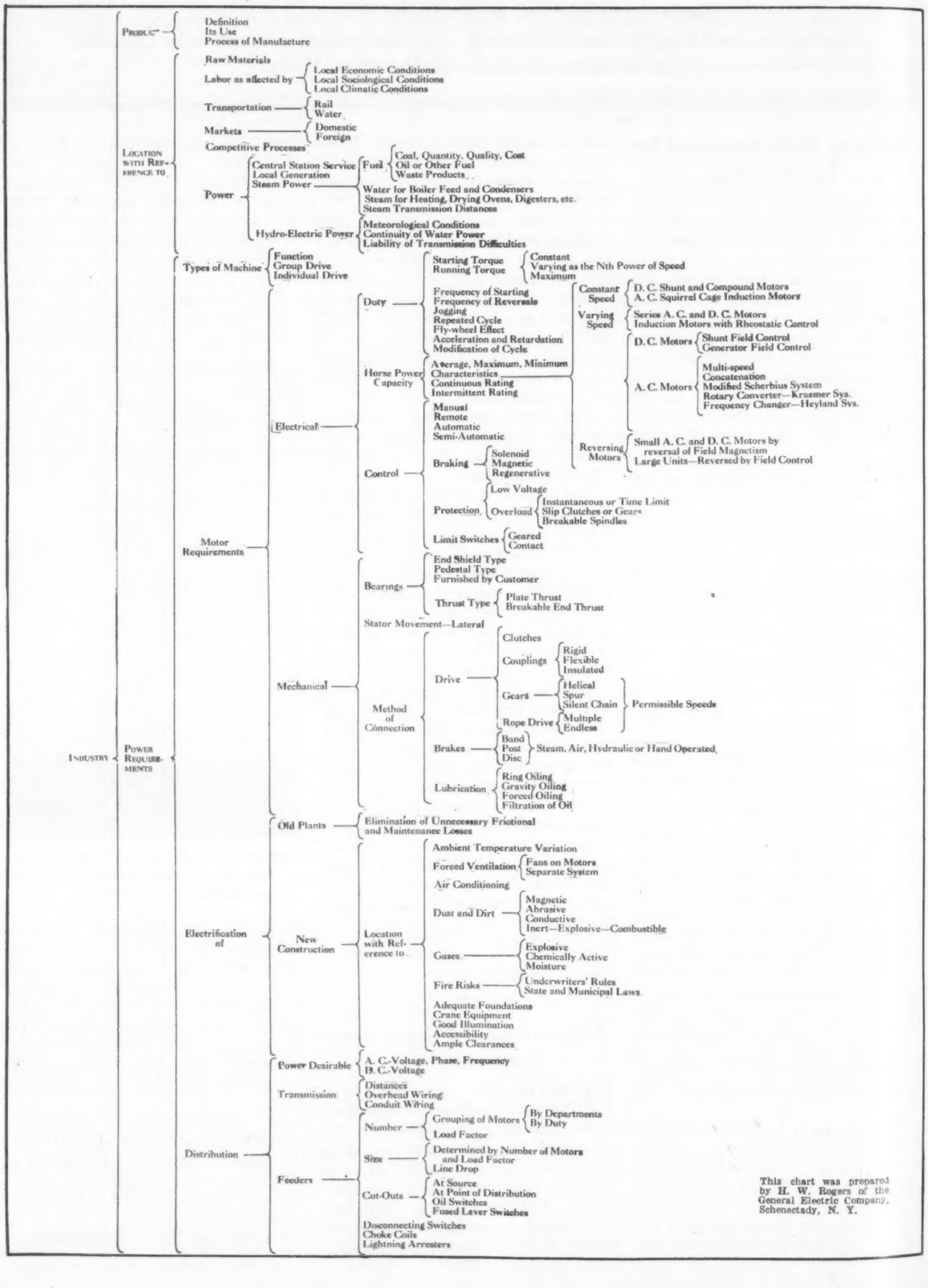
RECONSTRUCTION OF 60,000-VOLT LINE FOR 110,000 VOLTS SAVED $2,000 A MILE IN TOWER COST

much stronger structures at dead-end and deflection points, which were taken care of by new towers. Moreover, in some instances the intermediate suspension towers had to be raised by 5 ft. or 10 ft. More than 80 per cent of the old towers and 90 per cent of the old foundations could be utilized for this new construction.

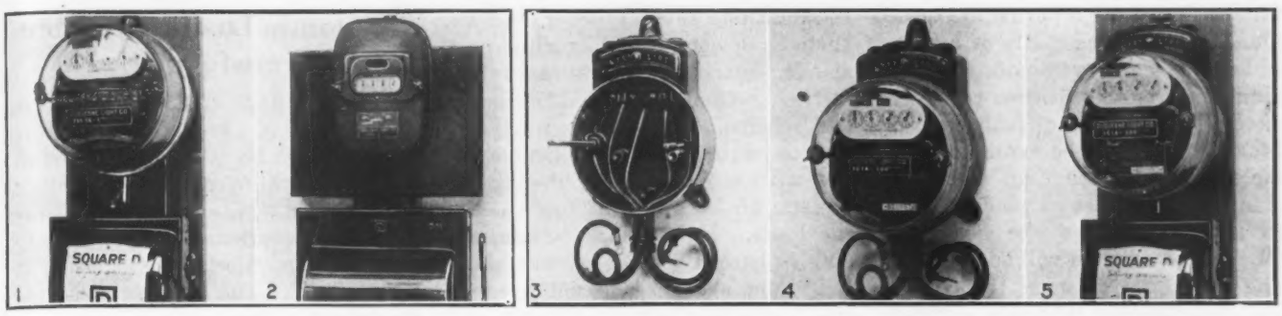
An analysis of the cost of the completed construction showed that the company saved at least $2,000 a mile in tower construction by utilizing the old towers and old foundations wherever possible.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

# Factors Influencing the Selection and Application of Motors and Control




This chart was prepared by H. W. Rogers of the General Electric Company, Schenectady, N. Y.




FIGS. 1, 2, 3, 4 AND 5—ADAPTING TOP-CONNECTED METERS TO STANDARD SAFETY CABINETS COST $1.25 PER METER

# Duquesne Company Modifies Meters

## Reconstructs Top-Connected Instruments to Meet Demands of Safety Cabinets and Plans Meters to Dispense with Terminal Lugs by Using Pipe Connection

BY SEALING up the terminals on old types of top-connected meters and bringing the four leads from the terminal block down in back of the meter elements and out through a ¾-in. nipple the Duquesne Light Company plans to utilize 14,000 of these meters in regulation safety cabinets. Up to date several hundred of them have been reconnected and installed on the system and the results obtained have been very satisfactory. Experiments to dispense entirely with the terminals of modern meters, using instead a nipple construction, as shown herewith, have also been made.

The present requirements of this company in regard to self-contained single-phase and polyphase watt-hour meter installations using standard meters are shown in Figs. 1 and 2. In order to make these requirements effective it became necessary to withdraw certain types of watt-hour meters from service. The disposal of the types withdrawn from service and the subsequent reconnection of a large portion of them may present some ideas to other utilities as well as to manufacturers of watt-hour meters.

On June 30, 1922, approximately 50,000 of the 170,000 watt-hour meters owned by the Duquesne Light Company were composed of Westinghouse type C polyphase and Westinghouse types standard, A, B, C, CB, CD, CE and CF single-phase meters. All of these meters were of the self-contained type with current ratings ranging from 5 amp. to 75 amp. Obviously, top-connected meters do not lend themselves to the idea of standardization, nor is it possible to effect an ironclad installation with this type. These considerations, together with the fact that some of the types were obsolete and that it was impossible to secure repair parts for others, were responsible for the order withdrawing all top-connected meters from service.

Standards and type A single-phase meters are now obsolete. Types B and C single-phase and type C polyphase meters are of little use because repair parts cannot be obtained from the manufacturer. It was decided to scrap these types as fast as they were withdrawn from service. Types CB, CD, CE and CF, with the exception of the 5-amp. and 10-amp. meter, were to be disposed of in a similar manner. This left approximately 14,000 5-amp. and 10-amp., top-connected, single-phase meters which could be used providing the method of connection could be changed. Orville Buys, superintendent of the equipment and tests department, developed an ingenious method for making the meters available for future use.

The scheme consists of sealing the entrances in the terminal chamber with high-tension cement and spot-welding the wing nut and bolt so that the plate over the terminal chamber cannot be removed. The bottom of the case is drilled and tapped for a ¾-in. nipple about 2 in. in length. Four marked leads of No. 10 B. & S. gage Clark's cable are attached to the terminal posts and are brought out of the case through the nipple, the space between the leads and the nipple being filled with high-tension cement so as to make a dustproof case. The case and leads of a reconnected type CD watt-hour meter are shown in Fig. 3.

A complete meter ready for installing is shown in Fig. 4. The nipples are supplied with a ¾-in. lock nut and bushing and an end wall containing a 1-in. hole with a center 1 in. from the face of the meter board. These end walls were procured from manufacturers on a special order. They can be made to fit any standard safety switch box. One of the meters and a safety switch box are illustrated in Fig. 5.

Very little trouble has been experienced in effecting the reconnection. As fast as the meters are withdrawn from service those types which are to be reconnected are packed in lots of one hundred meters and are turned over to a local machinist, who is under contract to complete the reconnection and return the meters to the meter department. The contract price is $1.25 per meter. The scrap value per meter is in the neighborhood of $1. Combining the scrap value and the cost of reconnecting the meters represents an investment of $2.25, and for this value the Duquesne Light Company is receiving a first-class watt-hour meter

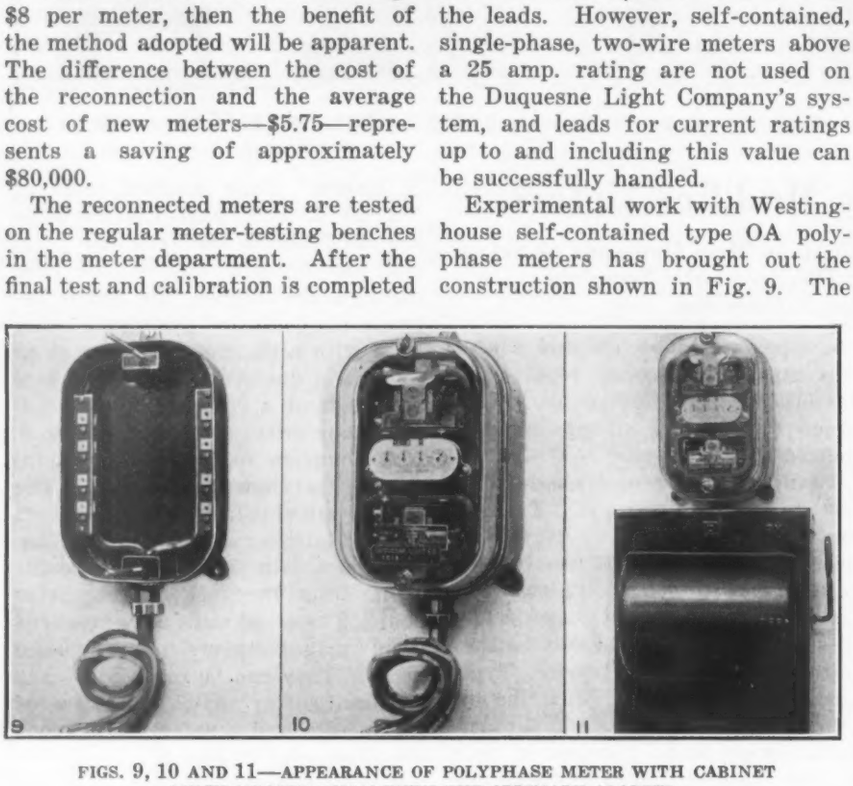
FIGS. 6, 7 AND 8—SUGGESTED ARRANGEMENT FOR NEW METERS

which is good for a period of service equal to the ordinary life of a meter and one which is even more foolproof than the regular bottom-connected meter. When it is realized that 14,000 meters will be made available for service, and that an equivalent number of new meters would average $8 per meter, then the benefit of the method adopted will be apparent. The difference between the cost of the reconnection and the average cost of new meters—$5.75—represents a saving of approximately $80,000.

The reconnected meters are tested on the regular meter-testing benches in the meter department. After the final test and calibration is completed each meter is packed in a container and placed in the stockroom. A special end wall is placed in the container by the meter packer. Reports that have been received from the meter foremen of the various districts state that these meters are easy to install on customers' premises and that field testing is simplified because of the flexible leads.

The results obtained from the use of these meters were so satisfactory that Mr. Buys decided to carry on further experiments on methods for connecting watt-hour meters. Fig. 6 shows a Westinghouse type OA single-phase case which was rebuilt in the meter department. The usual terminal chamber was replaced by a fiber terminal block to which four flexible leads were connected. The leads are brought out of the case through a ¾-in. nipple. Fig. 7 shows a complete meter, and Fig 8 shows the meter together with a standard safety switch box. Single-phase meters with this type of case and a similar method of connection are practically proof against tampering. In addition, several other factors, such as lower manufacturing cost, smaller space and more rapid field testing, recommend the adoption of the scheme. This method of connection would not be applicable for use with single-phase high-capacity meters on account of the size of the leads. However, self-contained, single-phase, two-wire meters above a 25 amp. rating are not used on the Duquesne Light Company's system, and leads for current ratings up to and including this value can be successfully handled.

Experimental work with Westinghouse self-contained type OA polyphase meters has brought out the construction shown in Fig. 9. The terminal chambers have been replaced by a nipple and the terminal blocks by two rectangular fiber blocks. Flexible cables are used for the connections to the elements. A complete meter and the same meter with a standard 60-amp. switch box are shown in Figs. 10 and 11. Complete data are not yet available as to the performance of this reconstructed meter.




FIGS. 9, 10 AND 11—APPEARANCE OF POLYPHASE METER WITH CABINET MUCH NEATER THAN WITH THE ORDINARY ADAPTER

The only questionable feature concerns the effect of the current in the leads for the upper element upon the lower element. However, up to 50 amp., there is no indication of interference. The highest permissible rating for self-contained polyphase meters is 75 amp., and further tests will be made to determine whether there is material interference with this value of current. Polyphase meters of this type of construction will possess the same advantages as the single-phase meters that were previously described.

C. B. WRIGHT,
Equipment and Tests Department.
Duquesne Light Company,
Pittsburgh, Pa.

## Economic Loading of Line Transformers

FIVE methods of determining the loading of transformers were discussed by H. W. Watt, electrical engineer of the Westchester Lighting Company, in a paper presented at the recent convention of the Empire State Gas and Electric Association at Utica, N. Y. The five methods are: Record of meter load, voltage tests during peak load, indicating ammeter and wattmeter readings, recording ammeter and wattmeter, and the use of a thermal indicator. The combination of a thermal indicator with recording ammeter and recording wattmeter was recommended. Operating a transformer underloaded is an inefficient utilization of the investment represented and is, furthermore, productive of low power factor and excessive core loss. Hence it should be avoided as much as exceeding the upper temperature limitation.

A properly loaded transformer may be defined as one in which the maximum load will heat the transformer coils to a temperature not more than 105 deg. or less than 90 deg. C. The upper limit should never be exceeded, the variation in the lower limit depending upon local conditions, such as expectancy of additional load and permanence of installation. Exceeding the upper temperature limitation is liable to burn out the transformer and interrupt the service. Often the latter is more serious than the former. Operating an underloaded transformer results in unnecessary investment, lower power factor and excessive core loss.

The question is what means should be employed to determine the transformer load so that the evils of overloading and underloading can be avoided. Those methods which have been in use for some time and those which have only recently come into use are given below, followed by a brief outline of the relative merits of each method:

1. *Survey of Secondary System and a Record of the Metered Load.*—This method was originally used at a time when the 16-cp. lamp was standard and constituted about 90 per cent of the total load. Domestic appliances were rare. Transformers were rugged and would stand an exceptional overload. Now new lamps are rated from 10 watts to 250 watts and domestic appliances and small motors are found in almost every house. It is not unusual for an incoming tenant to change all small lamps for large ones. The old-style, more rugged type of transformer might have stood this, but the more delicately designed ones now in use certainly can-

not. This method has therefore become obsolete.

2. *Voltage Test During Peak Load.*—This method is fundamentally faulty as it depends upon an overload causing sufficient excessive drop in a transformer. A voltage test taken only on the secondary side of a transformer shows nothing as the primary voltage may be low at the transformer location. The method also necessitates a more or less exact knowledge of the time at which the peak will occur. This is often difficult to predetermine.

3. *Indicating Ammeter or Wattmeter Readings on Secondary or Primary Side with Current Transformer or Split-Core Current Transformer.*—The use of indicating ammeters or wattmeters determines the load on the transformers at the time the reading is taken. This method is open to the objection that there is no record of the load at any other time than that at which the reading is taken.

4. *Recording Ammeter or Wattmeter.*—The use of recording instruments or maximum-demand instruments in place of the indicating instruments used in method No. 3 makes it possible to determine the entire load characteristics and is much superior to any of the above methods.

5. *Thermal Indicators.* — Recently thermal indicators have been used to indicate the load on a transformer by means of its temperature rise. Some of these devices show the actual temperature, while others indicate only when a dangerous temperature has been reached.

On modern secondary systems it is believed that the first three methods have become obsolete and that standard practice should be a combination of the use of thermal indicators with recording ammeters or recording wattmeters. Mr. Watt recommended that companies adopt these two methods with the assurance that by this means they can operate their systems to the best possible advantage, all factors considered.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

# Extracts from an Operating Code

BY FIELD EDITOR ELECTRICAL WORLD
New York, N. Y.

## Inspection and Care of Ring-Oiled Bearings

THE oil supply must be kept up to the proper level in ring bearings, but not too high, as oil might travel out along the rotating shaft, get into the windings of the machines and attack the insulation. The following rules are prescribed in the operating code of the Philadelphia Electric Company to insure the proper maintenance of ring-oiled bearings.

1. At least every hour, and oftener when necessary, examine bearings, noting: (a) That the oil rings are turning over and carrying oil; (b) that the bearing is not overheating; (c) that there is no chattering or vibration.

2. If the temperature rises to 160 deg. F. (70 deg. C.), steps must be taken to reduce it. In no case may the temperature of the oil be allowed to rise beyond 180 deg. F. (80 deg. C.).

3. When bearings are equipped with water-cooling jackets or coils, make sure that the water supply is not interrupted.

4. To reduce the temperature of a heated bearing, draw off the hot oil and at the same time put in a fresh supply, taking care not to allow the oil level to get below the usual point. Another treatment is to place ice on the oil reservoir on the outboard side of the bearing. Provision must be made to drain the water away from the machine to prevent it from running into the bearings or on the commutator or windings. In conjunction with either of the above methods, slightly loosen the bearing caps.

5. If either or both of these methods of treatment fail to cool off the bearings, the machine must be shut down when the oil temperature reaches the maximum as specified above.

6. If a bearing has been allowed to overheat to the point of melting the bearing metal, the load should be taken off and the speed reduced, if possible. Otherwise, it should be shut down at once.

## Cleaning Boilers for Inspection

BEFORE starting to clean a boiler for inspection it should be taken off the line, complying with the rules given on page 811 of the April 7 issue of the ELECTRICAL WORLD. The rules given below, which have been abstracted from the operating code of the Philadelphia Electric Company, should then be followed. The same rules apply to economizers:

1. If the boiler blow-off valves discharge into a common header, see that the valves are blocked to prevent reopening.

2. Remove manhole and handhole caps.

3. Start boring the tubes and scaling the drums as soon as possible after the boiler is empty. Bore all tubes clean and clean all scale from the drums and headers. In boring the tubes the rules given on page 1418 of the June 16 issue ELECTRICAL WORLD should be followed.

4. Sweep the boiler.

5. Remove any obstructions in the air holes of the tuyère plates.

6. Clean all of the openings and holes in the dry pipes.

7. Clean the superheater. Owing to sharp curves and the presence of a core in some types of superheater tubes, it is difficult to get anything that will pass through them. A piece of cable stubbed on the end should be pushed through the tubes not having a core. The tubes should then be blown out with compressed air.

8. Give the water column a thorough inspection: (1) Remove the water glass, cut-out valves and gage cocks. (2) See that all connections are open and clean. (3) Replace the valves, gage cocks and glass. (4) Pack all valves on the water column.

9. Pack all valves on the boiler and blow-down valves.

10. Overhaul all safety valves.

11. Repair the brickwork.

12. Repair the piping.

13. The boiler inspector should make an internal inspection.

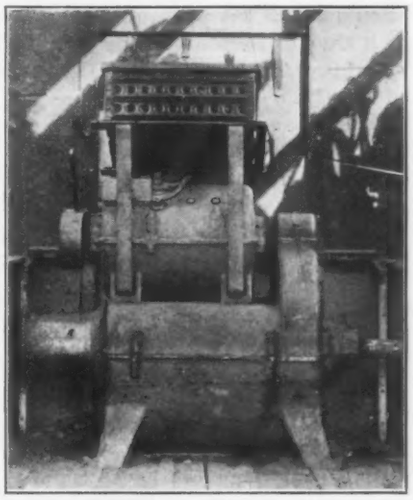
14. Head and cap up the boiler.

15. The boiler inspector should make a hydrostatic test. Care should be used in making the hydrostatic test to see that there is no leakage through the automatic non-return valve. If there is leakage, "blank off" at the automatic non-return valve. Do not allow the water to come in contact with the main stop valve. See that the drains between the main stop valve and the automatic non-return valve are open.

## Electric Truck Winch that Hastens Cable Laying

FOR speeding up the laying and removal of underground cable the Public Service Company of Northern Illinois has mounted an electric winch on one of its electric line trucks. This winch is driven by a 2½-hp., 1,500-r.p.m., motor operated directly from the 80-volt truck batteries. The entire outfit weighs approximately 1,500 lb. It has a gear ratio of 59.8 to 1 with over-all dimensions of 22.5 in. in length, 43.75 in. in width and 43.25 in. in height.

Although no operating costs have as yet been obtained, the winch has



MOTOR-DRIVEN WINCH EFFICIENT FOR LAYING AND REMOVING CABLE

installed 6,500 ft. of four-conductor 300,000-circ.mil cable and removed 5,000 ft. of the same size. The steady torque of the motor has helped in reducing sheath damage. The truck has been placed in service in the Oak Park district.

FIELD EDITOR ELECTRICAL WORLD.
Chicago, Ill.

# Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

## How to Pay Appliance Salesmen*

### With Central Stations Interested in Appliance Selling as Never Before, the Question of the Type of Salesmen and How to Pay Them Is of Vital Importance

By Howard A. Lewis
Manager *Electrical Merchandising*, New York

CENTRAL-STATION companies have a certain advantage in employing house-to-house salesmen as each company represents a substantial investment in community service. As an institution the company is known. It is therefore theoretically easier for the central station to make use of house-to-house men, and the sales resistance to be overcome by the individual salesman is less because of the element of public confidence that automatically accrues to the advantage of the company's accredited representatives.

The central station's field man has the maximum of local public confidence in selling electrical merchandise. Other things being equal, a central station's salesmen should do a larger volume of business and should reach his average production in a shorter period of time than will the representatives of any other type of electrical sales organizations.

The above is the first factor to consider in making out a sales compensation plan. A minimum of public suspicion is a cash asset to the specialty worker. The time that a salesman must ordinarily spend in inspiring the prospective customer with confidence in his integrity can in the main be utilized in direct sales solicitation. An increase in the daily number of productive calls is the result.

If we take the local market price for consumer sales work and deduct 10 per cent from the gross commissions paid, assuming that all other factors are equal (merchandise handled, sales management, delivery, service, local advertising, etc.), we have the most elementary basis for a payment schedule. If vacuum-cleaner salesmen receive 20 per cent commission, the central station's schedule figured on the above basis could be 18 per cent.

The second factor to consider is the question of drawing account. Will the salesman finance himself or will the company underwrite all or part of his operations? A certain length of time is necessary before any new man, regardless of his ability, can earn a living wage. It is also true that with an established salesman there are lean weeks or months during a year's cycle. A straight salary basis is the maximum drawing-account arrangement. It is now an accepted principle that every salesman is on a commission basis even though paid a straight salary. No matter how they are arrived at sales costs must bear their proper relationship to gross income if profits are to be made. A salesman's salary and expenses must eventually be figured as a percentage of sales and rewards paid accordingly.

#### Advance Cash a Problem

The real problem is how much cash to advance, if any, in anticipation of future sales. There are two sides to this problem, the company's and the salesman's. The company must consider first that the salesman may not make good, in which case all moneys advanced are wasted. This is a business risk which the company does not face if it operates on a straight commission plan. However, the company cannot control the activities of new men so closely when they operate on straight commission, and there is the practical danger of the salesman misrepresenting the merchandising and the company's policy in his anxiety to close sales. This makes for public ill will and kills the development of new "prospects." To overcome this objection to the commission plan, the company must have strong sales management, a sales plan and policy that is worked out in minute detail and actual field supervision by experienced men. This costs money and is apt to make for a high sales overhead expense.

The next factor is the possible dishonesty of the salesman. There is a small army of specialty salesmen who float from job to job. It is standard practice among some of these men to get cash advances, and then if sales do not materialize as quickly and as easily as anticipated they fade from the picture—whereabouts unknown. It is fairly easy for a company to be fooled by these men as they are plausible talkers and some of them are whirlwind salesmen—when they will apply themselves.

#### Danger of Fly-by-Night Salesmen

A proper system in hiring men, a surety bond and a sales manager who knows the game will keep these losses down, even though a cash advance plan of payment is used. The greatest damage done by unscrupulous "fly-by-nights" springs from the dishonest statements made in selling. They make enemies for the company, but they are clever enough to cover their tracks temporarily, and the damage does not appear until after they have moved on.

It is standard practice with the larger central stations to operate their house-to-house crews on a straight commission basis.

These men are not left to their own devices; they are carefully supervised—either by the company direct or by the manufacturer whose product is being sold. This is particularly true with vacuum cleaners. Some of the results that are being obtained with this central-station, manufacturer, straight-commission plan of operation are astonishing. It requires high-pressure saleswork and is not a game for amateurs. The turnover of salesmen is very high, varying from better than 100 per cent a year to, in one case, 33⅓ per cent. The average is nearer 100 per cent.

With the smaller central stations which have had no experience with

*Abstract of the Merchandise Sales Bureau's sub-committee report, presented June 7, at the N. E. L. A. convention in New York.

this work and do not desire to turn over the operations of their retail department to a manufacturer's organization the house-to-house proposition is different. As a practical matter, it is cheaper for this type of company to get taken in on a cash-advance transaction early in the game than to have men working on a straight-commission plan without supervision, forcing up their sales at the expense of the company's future business and public good will. Professional house-to-house commission salesmen left to their own devices cannot be trusted.

### DRAWING ACCOUNT IS NECESSARY

As suggested above, the committee believes that with the smaller central stations which wish to operate one or more house-to-house salesmen a drawing account is necessary. What that drawing account should be brings us to the salesman's side of this problem. No definite figure can be set as to what the amount should be. It must depend first on the type of salesman that is required to sell a device or particular group of devices; second, on general living cost in the particular community, and, third, on the living costs of the kind of men that are selected. Are they married or single? Are they young college graduates or mature salesmen with families to support who have been making their living selling other specialties?

### TYPE OF SELLING

This brings us to the third and most important factor to be considered in this report—to wit, the different kinds of consumer soliciting required to sell electrical merchandise. As a practical sales matter it is a long haul from peddling flatirons and vacuum cleaners from door to door to the negotiations involved in the sale and installation of a domestic ice-making machine in the home of a leading citizen. The type of man who can peddle flatirons is not the type of man who can obtain the proper entrée and sell the big idea of domestic ice making to the leading citizens of the city.

As the committee views the problem, there are two kinds or types of consumer selling as applied to electrical merchandise—first, house-to-house peddling or canvassing with popular-priced devices like flatirons or such well known and easily demonstrated appliances as vacuum cleaners; second, for want of a better name, what might be called "negotiation soliciting." This covers the selling of higher-priced items, such as washing machines, ironing machines, ranges and domestic ice machines or unknown merchandise.

With house-to-house soliciting the outstanding sales factors are, first, the total number of calls that are made by the salesman each day; second, the salesman's skill in telling a short story at the front door to get attention and interest and the opportunity to demonstrate and show his device; third, ability to make a convincing demonstration quickly; fourth, a willingness to ask for the order; fifth, a persuasive yet courteous manner in meeting objections; sixth, personal qualifications that include persistency, vitality, enthusiasm, a thick skin and a reasonable amount of native courtesy plus honesty.

### NEGOTIATION SOLICITING

The factors in "negotiation soliciting" are, first, the selection of the right people to call on, based on their domestic problems, their financial status and their influence in the community; second, the proper introduction or stage setting before undertaking the sales talk that definitely leads to a demonstration; third, ability to make a complete educational demonstration; fourth, skill in talking the financial phases of the transaction, including the money-saving value of the merchandise in reducing labor and saving time and also the terms of payment; fifth, skill in pointing out the social values and prestige that would result from the purchase; sixth, closing ability; seventh, personal qualifications that include analytical ability, and education and a personality that will allow the salesman to mingle with all classes of society with a feeling of equality, a social sense, a respect for the job and an ability to make others respect it, which means a standing in the community on a par with a good life insurance man or bond salesman.

In the average town a house-to-house salesman working for a central station should be able to make $100 to $150 a month. An exceptionally good man should be able to average $200 a month.

The local commission schedules must be so fixed that the man who makes a full number of calls six days a week can equal this amount. The Fuller Brush organization sets twelve demonstration calls a day as the bogey for a day's work.

During 1922 vacuum-cleaner salesmen averaged three machines a week, insuring a revenue of from $30 to $36 a week figured on a 20 per cent commission basis. These figures represent a national average for all vacuum-cleaner men working for manufacturers, dealers and central stations. The turnover, however, of vacuum-cleaner sales was high, a national average probably of 100 per cent a year. When you compare this with a yearly turnover of only 30 per cent, which is the average for one of the largest insurance companies, the sales waste in our industry is apparent.

The committee recommends that we make this task of "negotiation soliciting" a three-thousand-dollar-a-year job with a drawing account high enough to attract three-thousand-a-year men or better, and that we keep our nerve and do not reduce commissions should a good salesman make $5,000 or $6,000.

"Negotiation" type solicitors can be used permanently by small central stations as well as large.

An example: Given, a town with two thousand homes wired and no electrical dishwashers in use—possibly a 15 per cent saturation of washing machines, a 36 per cent saturation of vacuum cleaners and a 72 per cent saturation of flatirons.

### EFFECT OF "CROWD PSYCHOLOGY"

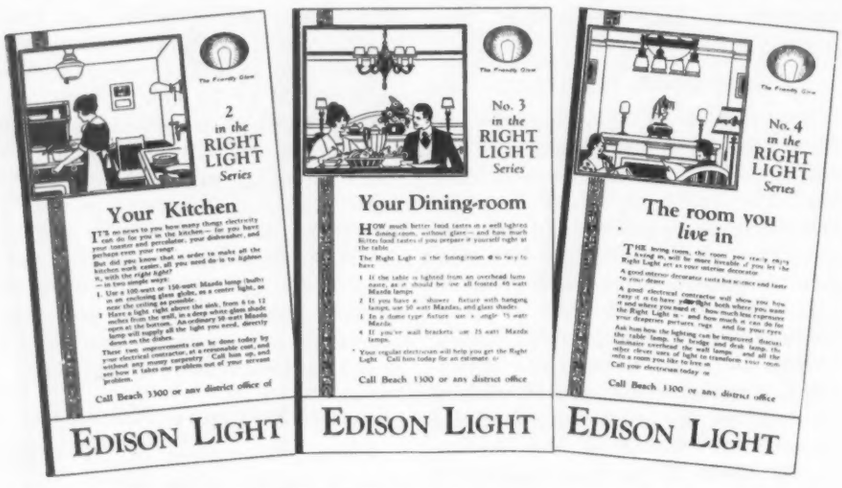
A doorbell canvass of the entire two thousand wired homes might produce 5 per cent of sales with 95 per cent of the possible buyers registering a definite no. In a small community the women discuss among themselves their front-door experiences with canvassers. When the majority have said no to a proposition a negative "crowd psychology" develops which is intensified by the fact that each woman knows that her neighbor has also registered in the negative. The costs to the company in such a case are high and the returns to the salesman very low. On the other hand, suppose there is one high grade man assigned to the dishwasher. He knows his public and can get entrée. This man will select 5 per cent of the homes as his "prospects" and then set out and sell to these homes. The people he selects are community leaders. After sales are made to this 5 per cent, dishwashers will be known and talked about. There will be a favorable local opinion about washing dishes electrically as opposed to a wholesale "no," as under the first plan.

When this special salesman's bogey is reached, the town is then

ripe and ready for a doorbell attack, one of the big sales arguments being the local list of satisfied and happy users. Here we have a possibility of volume dishwasher sales, with the company making money and the salesmen satisfied. The special man then moves on to another device.

Regarding payment, while the "negotiation" man has the dishwasher, the commission is 20 per cent or 25 per cent; when the crews take it the commission is 15 per cent or possibly 12 per cent. By this plan, over a period of two years, the commission paid would be an average commission, the volume of sales larger, and all the salesmen better satisfied.

Good "negotiation" salesmen, over a period of time, finance themselves and can be made to show a profit to the company not only on the sales they make directly but from increased store sales. The specialties of yesterday are the staples of today.


2 in the RIGHT LIGHT Series
Your Kitchen
Call Beach 1300 or any district office of
EDISON LIGHT
No. 3 in the RIGHT LIGHT Series
Your Dining-room
Call Beach 1300 or any district office
EDISON LIGHT
No. 4 in the RIGHT LIGHT Series
The room you live in
Call Beach 1300 or any district office
EDISON LIGHT

PART OF A SERIES OF ADVERTISEMENTS SHOWING PROPER LIGHTING FOR THE HOME

### THE SALES CYCLE

In this sales cycle of an electrical specialty the proper introductory placing of the appliance has much to do with the time it takes for the specialty to pass through the educational or novelty stage to the canvassing period and to over-the-counter distribution with a profitable volume.

With most central-station companies, if not with all, the washing machine, the ironing machine, the dishwasher, the range and the ice-making machine represent local sales problems that can be solved with "negotiation type" of salesmen. Each central station should develop a sales-payment plan for these "negotiation" men that will attract real brains and ability. The committee believes that the selling of these new electrical specialties should become a sales profession on a par with the best of insurance-selling practice. What is being done today with house-to-house peddling crews is not a precedent. The two types of selling are different—each has its place. Their functions must not be confused when making out payment schedules and building a sales organization.

## "Right Light" Publicity of Boston Edison

KEYING its advertisements upon the term "right light," the Edison Electric Illuminating Company of Boston has recently prepared a series of announcements to be run before the end of June in Boston and suburban dailies and weeklies, including news and financial papers. The advertisements feature the value of proper illumination and adequate convenience outlets. What correct lighting means to the laundry, living room, kitchen, dining room and sleeping room is concisely explained in these advertisements, with recommendations for lamp sizes and fixture types.

Co-operation with the contractor-dealer is an important feature of these displays, the company sending inquiries to representative wiring firms upon request and advising consultation with reliable contractors before the purchase, sale or improvement of residences. The relation of good lighting to profitable real-estate handling is touched upon together with the economic aspect of paying for improved illumination on installments. L. D. Gibbs is superintendent of the advertising department of the Boston company.

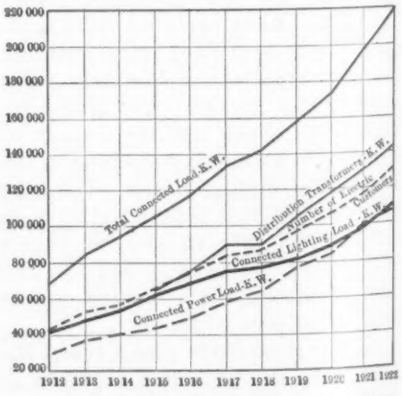
## New York Edison to Merchandise Small Power

WITH the expansion of its commercial policy to make it easier for customers to buy electrical appliances the New York Edison Company has adopted a practice of merchandising small power appliances and equipment to its existing customers which in the aggregate will bring a substantial increase in energy consumption and revenue. The company's power bureau is now making a survey of its present customers to determine the possibilities of adding to their equipment by the installation of small industrial heating devices, ventilating fans and refrigerating equipment.

To facilitate the purchase of this apparatus by the customer the company is extending the privilege of the deferred-payment plan, whereby the customer may pay for the apparatus in monthly installments extending over a period of one year. As a great deal of the manufacturing done in New York City is in small factories and shops having a connected load of approximately 15 kw., and under, it is believed that here is an almost unlimited field for development of the power load.

## Growth of Power Load in Northern Illinois

ANALYSIS of the power load taken on by the Public Service Company of Northern Illinois in the last few years shows that while the ratio of the connected load to the distribution transformer capacity for the years 1915, 1916 and 1917 had been 1.55 this ratio was lowered to 1.51 in 1922. This improvement was made despite the fact that the




GROWTH OF CONNECTED LOAD ON LINES OF PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS

power load connected had been increasing at a much faster rate than the lighting connected load. The present appliance load now forms between 10 and 35 per cent of the lighting load.

Examination of the accompanying chart shows that the connected power load gradually approached the lighting load until the latter part of 1920, when the power load exceeded the lighting load. But during the year 1922, because of the great home building program, the lighting load again exceeded the power load. It is expected, however, that during the next year or two the power curve will cross the lighting load, perhaps never again to be recrossed.

## Fresh Capital for Utilities Prevents Community Stagnation

ANOTHER effective advertisement run by the Haverhill (Mass.) Electric Company as part of its educational publicity program points out the importance of attracting capital for community development along essential electric service lines and

**More than $2,500,000 working for this community**

***Keep it working***

SUPPOSE this community had to raise $2,500,000 in order to preserve itself from stagnation—where would the money come from?

It would be drained from the industrial and commercial activities upon which the community thrives.

Yet this community would raise that money—no matter how industry and commerce suffered—rather than do without electricity. For electric light and power are absolutely essential to modern life—industrial, commercial, social.

More than $2,500,000 has been gathered, not *from* this community, but to work *for* this community. In other words, this community has hired that money to provide the power plants, service stations, lines, equipment, and organization necessary to supply electric light and power.

That money works for this community. It works for simple wages. It is entitled to those wages—to a fair rate of interest.

If those wages are not paid, no further money will be lent. If no capital is available, the public utilities cannot expand. And this community—or any other community—can grow no faster than its public utilities.

HAVERHILL ELECTRIC CO.

calls attention to the right of money to "simple wages" when engaged in this kind of work. The advertisement, the text of which is given here, is one of a series which is being prepared by Charles H. Tenney & Company, Boston, managers of the Haverhill and other Eastern utilities.

## Central Station Boosts Its Territory

AN EXAMPLE of how the utility can promote the interests of the territory it serves is seen in this electrical sign, containing 1,500 25-watt daylight lamps, which has been

CENTRAL STATION'S ELECTRIC SIGN BOOSTS TERRITORY SERVED

installed on the screen well of the Waterside station of the Louisville Gas & Electric Company. The sign announces to travelers that Louisville is the "Gateway to the South." It is 200 ft. above the level of the water and 150 ft. above the street level and can be read from the Indiana shore.

## Operating Costs of Electric and Gasoline Trucks

CAREFULLY kept operating costs of four electric trucks used by the San Joaquin Light & Power Corporation indicate that the cost of operation for the first month the trucks were in service was less than half the operating cost of gasoline trucks of the same size.

The table below shows the cost of power per mile for the electric trucks as compared with the cost of gasoline and oil used by gas trucks of the same capacity. The average per ton-mile for the electric trucks was 2.07 cents, while for the gasoline trucks it was 4.16 cents.

COST IN CENTS PER MILE TO OPERATE ELECTRIC AND GASOLINE TRUCKS

| | Capacity, Tons | Electric, Cents per Mile | Gasoline, Cents per Mile |
|---|---|---|---|
| Truck No. 1 | 0.75 | 1.73 | 2.20 |
| Truck No. 2 | 1 | 2.63 | 5.77 |
| Truck No. 3 | 2 | 3.27 | 9.91 |
| Truck No. 4 | 2 | 3.47 | 6.17 |
| Average per ton mile | | 2.07 | 4.16 |

This study was made from carefully kept costs for one month for the electric trucks and from records of gasoline cars extending over a period of several years. In the opinion of the engineering department which made the analysis the cost of operation for the electric trucks will be even lower than is shown by the first month.

## What Other Companies Are Doing

**Franklin, Mass.** — Twenty-five electric ranges were sold in two weeks recently by the Union Light & Power Company, which serves about 3,700 customers in southern Massachusetts. Fifty vacuum cleaners were sold during April on the basis of an allowance of $3 for each old broom turned in. E. S. Hamblen, manager, states that merchandise sales per customer for the company in 1922 were $15.20. This is believed to be a record in this line. L. A. Fiorani is commercial manager.

**Nyack, N. Y.**—In selling 130 vacuum cleaners of a single make in its first month of a campaign recently the Rockland Light & Power Company, a Tenney property, created a new record in cleaner sales for upstate New York. This applies to any organization in the state other than in Brooklyn or New York City, and the company hopes to exceed 1,000 cleaner sales of this type during the year.

**Minneapolis, Minn.**—"The Woman in the Case" is the title of an interesting brochure which the Northern States Power Company has prepared in furthering its customer-ownership plan. It deals with the problem of systematic saving which confronts a newly married couple and brings out the advantages of public utility stock. The story is a narrative of how they progressed toward true economy instead of drifting without any systematic program of saving. The booklet also explains the physical property behind the company's stock.

**Hartford, Conn.**—Plans are afoot to carry on the work of the battery and vehicle department of the Hartford Electric Light Company as a separate corporation to be known as the Electric Transportation Company, Inc. The new organization will take over the company's garage, offices and service station and will continue to operate the battery service system for electric trucks which has been so popular in that city for the past few years. W. M. Thayer is in charge of the battery and vehicle department.

# Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

## Hydro-Electric Development and Steam Equipment

*Water Turbines and Regulators for the Ritom Power House.*—V. GELPKE.—The extraordinary requirements of safety and flexibility of operation imposed upon its power houses by the Swiss Federal Railways, particularly in the case of the Gotthard road, necessitated installing in the Ritom hydro-electric power station water turbines, regulators and hydraulic controlling devices which represent one of the most difficult and exacting installations of the kind. The 12,200-hp. single-runner Pelton turbines, operating under a head of 800 m., reach a peripheral speed of 60 m./sec. (333⅓ r.p.m.) impelled by a single water jet of 123 mm. diameter, with a nozzle velocity of 120 m./sec. The turbine and directly connected single-phase generator of 9,000 kw. have been tested at 608 r.p.m. (82 per cent overspeed), under a load of 11,300 hp. with no damage to the set. Needle regulation combined with a jet deflector are provided, both operated by high-pressure servo-motors. An auxiliary water jet, impinging upon the backs of the buckets, reduces the time to stop the set from one hour to three minutes. The article contains eighteen drawings of the complete turbine.—*Zeitschrift des Vereines Deutscher Ingenieure*, May, 5, 1923.

## Transmission, Substations and Distribution

*Terminal Boxes for Lead Cables in Farm Installations.*—E. RAGER.—Lead cables are being used to a great extent in farm installations. Certain difficulties have been encountered in making the connections in such a manner as to exclude the humid air. The author describes a system of terminal boxes which, he claims, will obviate the disadvantages of the old system.—*Teknisk Tidsskrift, Elektroteknikern (Danish)*, March 21, 1923.

*Fire Risk from Poorly Made Farm Installations.* — K. SCHNEIDERMANN. — The constantly increasing number of fires due to poorly installed light and power lines on German farms has resulted in a systematic investigation of a great number of installations. The author gives an extremely interesting account of conditions found on some of these farms and describes the cause of a number of great farm fires. Twenty illustrations give vivid evidences of electric failures, due to carelessness, incompetence or defective material, some of which were discovered in time, but many only after a fire.—*Elektrotechnische Zeitschrift*, April 19, 1923.

*Alternating-Current Secondary Networks.*—D. K. BLAKE.—Great attention has been paid to every detail of power-station and substation equipment and also to the details of transmission lines, but in the past such minute study has not been given to the distribution system. The author takes up this study and treats it in detail in a way that should be of interest to those responsible for the distribution of energy.—*General Electric Review*, June, 1923.

## Generation, Control, Switching and Protection

*Isolated Phase Arrangement of Switching Equipment.*—P. M. CURRIER and W. T. O'CONNELL. — The authors fully describe the "isolated-phase" construction for switching equipment and explain the merits of the system. The vertical and horizontal construction are discussed, and illustrations emphasize the points brought out. Attention is called to the fact that when the phases are isolated phase-to-phase short circuits will be practically eliminated.—*General Electric Review*, June, 1923.

*Calculation of the Dimensions of Oil Circuit Breakers.*—P. CHARPENTIER.—The design of oil circuit breakers, from both the electrical and the mechanical viewpoint, should be based upon the known short-circuit conditions of the circuit in which the breaker is to be used. From an extended study of arcs under oil the author gives a formula for the amount of gas generated by an arc of known energy and duration. This amount of gas, the writer assumes, forms a more or less cylindrical gas pocket within which the ionized gas may be considered as electrically conductive. The transient dimensions of this pocket give, therefore, the required minimum distances between phases of the breaker and between phases and tank walls. The height of the switch tank is determined by the length of the arc, the dimensions of the contacts and the safe oil level above the contacts. To insure the theoretically most advantageous break within half a cycle an entirely too high speed of opening would be required, such as, for example, more than 100 miles an hour for 50,000 volts. In practice one-tenth of this speed is usually the limit. The creation of a vacuum under the oil because of a too rapid motion of the contacts is not to be expected unless the speed of the contacts should exceed 130 miles an hour, assuming a pressure of 5 atmospheres in the immediate vicinity of the break. On checking up the characteristics of existing switches, the author's formulas were found to come within 2 per cent of their dimensions and rupturing capacities. The reticence observed by American designers of switchgear is regretted by the author, who makes the assumption that, if these formulas give such close results, discretion may serve to cover up the possible embarrassment of finding a switch to be either entirely inadequate or too large and costly for the purpose for which it is used.—*Revue Générale de l'Electricité*, May 5, 1923.

## Units, Measurements and Instruments

*Electric Testing Laboratory of a Porcelain Factory.*—P. CRUSSARD.—A laboratory for routine testing of porcelain insulators is described, consisting of a 60-hp. motor-generator set supplying an oil-insulated testing transformer, with series-parallel arrangement of the low-voltage winding to obtain either 125 kv. or 250 kv. on the high-voltage side. The voltage of the single-phase generator on the motor-generator can be regulated from 15 to 500, which gives the wide range of testing voltages on the secondary of the transformer. Three sphere gaps of balls 62, 125 and 250 mm. in diameter are provided to measure voltages of up to 90 kv., 180 kv. and above, respectively. A voltmeter in the low-voltage circuit of the transformer, graduated in values of the high-voltage winding, gives readings previous to the flashover of the spheres. The usual apparatus for rain tests is installed. Safety switches are provided, opening the circuit when the gate to the high-voltage room proper is opened.—*Revue Générale de l'Electricité*, May 5, 1923.

*Permissible Loading of Cables.*—The permissible current loading of British standard impregnated paper-insulated electric cables, as specified in the report of the British Electrical and Allied Industries Research Association, is given. The report includes current-loading tables for cables laid directly in the ground, in the air and drawn into ducts. A great deal of theoretical and experimental work, as, for instance, on power losses in the cable, dielectric constants, thermal constants, current rating, etc., is also included. The tables are for 600-volt to 11,000-volt cable, single-core, concentric and three-core.—*Journal of the (British) Institution of Electrical Engineers*, May, 1923.

## Illumination

*Transmission of Speech by Light.*—A. O. RANKINE.—The transmission of speech by light is effected by modulating the intensity of a beam of light by means of the acoustical vibrations. In the distance the fluctuating beam falls upon the receiver, a selenium cell in circuit with a battery and telephone. The selenium can control the current because it is a better conductor of electricity when illuminated than when in darkness. Thus the brightness of the light and the telephone current vary in correspondence with speech vibrations. In the method described by the author he stated that the transmission

of speech by light still depended upon selenium, though he would gladly abandon selenium in favor of a superior substitute. — *Engineering (London)*, April 27, 1923.

*Artistic Color Lighting in Motion-Picture Theaters.*—S. L. ROTHAFEL.—The lighting effects produced by the author at the Capitol Theater, New York, are the result of study of the psychology of the audience. He has found that the ideal lighting arrangement is soothing to the mind and nerves and at the same time stimulating to the imagination. As a result of this theory he describes the way he builds the lighting effects for various units or parts of a program.—*Transactions of the I.E.S.*, May, 1923.

## Motors and Control

*Electrification of Allegheny Plate Glass Company.*—G. P. WILSON.—Primarily the author discusses the modern developments that have taken place in the plate-glass industry. Many of the processes are quite complicated, but the real solution of most of the problems has been made simple and practical by the use of electricity. The author gives a clear idea of the extent to which electricity is being used in glass plants and then briefly traces the process through which the ingredients must pass and how they are handled before a finished sheet of glass results.—*Electric Journal*, April, 1923.

*Operation of Low-Speed Elevator Electric Motor Controller.*—C. A. ARMSTRONG. — A detailed explanation is given of the controller's operation, after which a number of the troubles which may develop are enumerated and the methods for locating them explained.—*Power*, May 1, 1923.

*Synchronous Motor-Generators for Coal Mines.* — E. J. GEALY. — The author discusses the relative advantages and disadvantages of synchronous motor-generators and rotary converters for coal mines. Present tendencies show that the former may take the place of the latter. Of the two machines, the motor-generator seems to be better adapted for the purpose on account of greater stability, less complication, easier operation and greater adaptability to the coal-mine load, which is very irregular in character.—*Coal Age*, May 3, 1923.

## Heat Applications and Material Handling

*Electric Furnace Detinning and Production of Synthetic Gray Iron from Tin-Plate Scrap.*—C. E. WILLIAMS, C. E. SIMS and C. A. NEWHALL.—Experiments were conducted in a small electric furnace in which tin-plate scrap was melted with different addition agents in attempts to remove the tin from the iron. Sodium chloride, iron sulphide and an oxidizing slag were used under various conditions. The conclusions reached were that in the electric furnace complete detinning is impossible and any detinning impracticable. Melting tests conducted in the cupola showed that the amount of detinning was dependent upon the amount of surface of metallic tin exposed to the oxidizing gases and will be somewhere between the limits of 0 and 50 per cent. Test bars, prepared by melting pig iron with various quantities of tin, were subjected to physical tests. The results showed that a tin content of 1 per cent or less did not seriously affect the properties of gray iron. —*Paper presented before the American Electrochemical Society, New York*, May 3-5, 1923.

## Electrophysics, Electrochemistry and Batteries

*Copper Electric Plating Applied in Metallurgy.*—A. BARATTINI.—It is well known that copper electric plating is used in steel-case hardening to maintain elastic resistance and facilitate the treatment of certain parts of the metal. For example, in hardening a gear copper plating is used at the points of the teeth. Its use forms the subject of this article, in which the author fully describes the latest improvements made in this method, giving scientific and industrial examples. — *Elettrotecnica*, April 15, 1923.

## Traction

*Self-Propelled Electric Locomotive.*—P. OSTERTAG.—A full description, with many illustrations, of the new self-propelled electric locomotive recently tested in Switzerland. This car, which is to operate light trains only, is equipped with a 200-hp., 440-r.p.m. Diesel engine which drives a direct-current generator, the latter energizing two direct-current motors. Benzol is used as a fuel on account of the high cost of gasoline, and its consumption is very reasonable. The maximum speed obtained is 45 miles per hour.—*Ingegneria*, Feb. 1, 1923.

*Observations on Electric Railway Practice.*—W. P. POTTER.—An abstract of this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. midwinter convention, Feb. 24, 1923, on page 441.—*Journal of the A. I. E. E.*, May, 1923.

## Telegraphy, Telephony, Radio and Signals

*Impedance of Smooth Lines and Design of Simulating Networks.* — R. S. HOYT.—In the first part of the paper the author presents in a comprehensive manner the dependence of the characteristic impedance of the various types of smooth lines on frequency and on the line constants by means of descriptions accompanied by equations transformed to more suitable forms by graphs. In the last part of the paper he describes the principal networks devised for simulating the impedance of the various types of smooth lines.—*Bell System Technical Journal*, April, 1923.

*Radio Transmission Measurements.*—R. BROWN, C. R. ENGLUND and H. T. FRIIS.—The first section of the article briefly analyzes the radio transmission circuit into (a) the sending or radiating portion, (b) the transmitting portion, consisting of the ether path through which the radiated waves travel, and (c) the receiving portion. The relation of these from the standpoint of the radio transmission engineer is discussed, pointing out the need of quantitative data as to the electric field strength of waves and radio noise conditions to allow the rational design of radio systems. The second section is devoted to descriptions of apparatus which has been developed for measuring the electric field strength of the radio waves, its theory and method of use. The third section deals with the measurement of radio noise.—*Proceedings of the Institute of Radio Engineers*, April, 1923.

*Experiments with the Neon Tube.*—S. O. PEARSON.—The author explains how the neon lamp can be made to produce oscillating current, thus making it applicable for using with radio equipment. He describes how an instrument could be made up giving a whole range of note frequencies, either in steps or continuous. This instrument can be used to determine frequency. As an instance he mentions that the apparatus could be used in testing low-frequency amplifiers over a wide band of speech frequencies, making it possible to detect undesirable resonant frequencies in the amplifier.—*Wireless World*, April 7 and 14, 1923.

*How to Measure Antenna Resistance and Capacity.*—A. F. MURRAY.—Unless the resistance and capacity of an antenna are known the power output or the transmitter efficiency cannot be determined. The author gives a method, known as the substitution method, in which a dummy antenna with the same constants as the actual antenna is built up and measured.—*Q S T*, May, 1923.

## Miscellaneous

*Problems Confronting the Engineering Profession.* — L. W. WALLACE. — In the opinion of the author, engineers have in the past neglected many factors of importance with which the engineers of today must wrestle. There are many phases of industrial leadership yet unsolved, relating particularly to the distribution, financial, production and human factors of industry. The report indicates many fields in which there is ample opportunity in American industry for the engineer to do splendid work. It is the duty and responsibility of the engineer to study and help solve the problems encountered today, and by virtue of his engineering education he is in a position to do this.—*Sibley Journal of Engineering*, April, 1923.

*Oscillations by Breakdown of Condensers.*—R. RUEDENBERG. — Formulas for current and frequency of the arc are deduced in an investigation of an undamped circuit presupposing invariability of sum of magnetic and electrostatic energy. The frequency and the current of a thunderbolt depend on the diameter of the cloud, not on the elevation. — *Tydschrift voor Electrotechniek*, May, 1923.

# News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

## World Power Conference

**Active Participation of the United States in 1924 London Meeting Voted by National Societies**

THE United States will be an active participant in the World Power Conference to be held in London, England, in 1924. This was decided at a meeting of delegates chosen from the various national professional, technical, business and commercial societies, including representatives from the national government, held in New York City on Wednesday of this week. The plan of organization, drawn up by a sub-committee of which John W. Lieb of the New York Edison Company is chairman, was adopted, and the following officers were elected: Honorary chairman, J. W. Weeks, Secretary of War of the United States; chairman, O. C. Merrill, executive secretary Federal Power Commission, Washington; first vice-chairman, Henry J. Pierce of Seattle.

COMMITTEE OF ONE HUNDRED

Three other officers elected but without particular designation were: Calvin W. Rice, secretary of the American Society of Mechanical Engineers; Peter Junkersfeld of the firm of McClellan & Junkersfeld, consulting engineers, and W. M. Steuart of the Census Bureau, Washington. According to the present plans, the American committee, World Power Conference, will be made up of a general committee of approximately one hundred with a small executive committee of from nine to eleven persons.

L. B. Stillwell, consulting engineer, New York, outlined some of the work which the committee might profitably undertake, with particular reference to power development in the North African colonies of France. He suggested that the financial and legal as well as the engineering phases of power development should have ample consideration.

H. I. Harriman, banker and public utility operator of Boston, representing the American Chamber of Commerce, laid particular emphasis on the advisability of delegates from the United States dwelling on the economic and political features of power development. He was insistent that the world should know that this nation has made wonderful progress along these lines, chiefly because it stood for private ownership and the exercise of private initiative.

W. H. Onken, Jr., ELECTRICAL WORLD, New York, recommended that the United States contribute to the conference certain outstanding features of power development in which it leads the world, including hydro-electric development, electric transmission and interconnection of superpower systems. These are almost universal in their application and on them the United States better than any other nation can make authoritative contributions. The advantage of concentrating on a few subjects of worldwide interest was emphasized.

It was the general understanding that all delegates to the World Power Conference will pay their own expenses and that none of the professional and business associations will be called upon to make any contributions toward operating expenses of the committee.

## Dayton to Be Center of Large Interconnected System

Announcement has been made by the Dayton Power & Light Company that arrangements have been completed for interconnecting power stations with an aggregate capacity of 250,000 hp. at the Miller's Ford station. This, the company says, will make Dayton the center of a "superpower" zone unequaled in that part of the country. The stations to be connected with the Dayton plant are the new West End generating lines of the Union Gas & Electric Company of Cincinnati and two smaller hydro-electric plants at West Milton and Covington. The steam generating plant of the Dayton, Covington & Piqua Traction Company at West Milton will be abandoned under the plan.

## Electro-Steam Boiler Installed at Berlin (N. H.) Mills

The use of excess hydro-electric power for the generation of steam has received a new exemplification at the mills of the Brown Company, Berlin, N. H., where the Electric Furnace Construction Company of Philadelphia has just installed an electro-steam boiler rated at 18,000 kw. and operating at 22,000 volts, three-phase, 60 cycles, with a steam pressure of 135 lb. gage. The boiler consists of three single-phase tanks. This is said to be the only boiler ever installed to operate at so high a voltage, and, according to the manufacturer, the results obtained from its use are remarkably gratifying, surpassing the expectations of both the Electric Furnace Construction Company and the Brown Company.

## Pennsylvania Power Acts

**Résumé of Legislation of 1923 Affecting Hydro-Electric Development and Other Power Projects**

THE program of power legislation advocated by Governor Pinchot of Pennsylvania was completed by the passage of the general power bill and the companion condemnation bill on the last day of the legislative session. It included the preparation of what the administration terms sound and far-seeing plans for the future as well as provision for present needs.

"GIANT POWER SURVEY"

Most significant for the future is the act creating a "giant power survey board" composed of high state officials including the Governor in addition to a deputy attorney-general and an engineer to be appointed by him. This board is to make an outline survey of the power resources available for the supply of Pennsylvania's needs and will recommend a policy to be embodied in legislation by the General Assembly convening in January, 1925. The end in view is the most efficient development of the state's great fuel-power resources, supplemented by water power, the pouring of the general output of these fuel and water-power resources into a common reservoir of interconnected transmission lines covering the Northeastern States and the service of the industries, farms and homes of Pennsylvania from this common reservoir. The possibilities and advantages of locating great power plants at the coal mines, saving the by-products of coal now wasted in fuel-power plants, electrifying railroads and co-ordinating flood prevention and stream purification, so far as practicable, with water-power development are to be investigated.

THE TRI-STATE COMPACT

Related to the "giant power survey act" is the act authorizing the Governor to designate three officers of the commonwealth to negotiate with New York and New Jersey a compact for the regulation of the Delaware River and the apportionment of its waters. New York and New Jersey have passed similar statutes carrying appropriations for surveys and plans. Such a compact negotiated with the consent of Congress will be binding upon all interests when ratified by the three states. The complete regularization of the Delaware by storage of the whole flow, thus preventing floods, will develop power estimated at 400,000 hp.

Present needs are met by an act

regulating future permits granted by the Water Supply Commission for dams and changes in streams to develop water power and to store and use water for steam raising and steam condensation in the generation of electrical energy for use in public service.

As to future permits the principles of the federal water-power act are to be applied. If the waters concerned are under federal jurisdiction, the state permit will be contingent upon the permittee's obtaining a federal license, the conditions of which may be enforced by the commonwealth if and to the extent that the federal government is unable to enforce them or waives them. If the waters concerned are not within the jurisdiction of the United States, the act fixes a maximum time limit of fifty years with extensions and renewals until the capital prudently invested on the faith of the permit has been repaid by the commonwealth or by a new permittee. It also gives to the state broad powers to impose conditions like those in a federal license. A system of fees will be established to pay the cost of administering the act. The right to flood islands owned by the commonwealth, hitherto inalienable, may be granted by the board.

A companion act restores to public service companies holding permits the right to condemn waters and lands under water which was taken away by the Pennypacker act of 1905; their condemnation rights are enlarged in other respects and they may flood, relocate and reconstruct highways, bridges and railroads. The exercise of all these powers is to be controlled at every step by the board.

Another act authorizes the Department of Forests and Waters to lease state forest lands for power projects for periods not to exceed fifty years.

## Premier Drury of Ontario on Public Ownership

Premier E. C. Drury of the Province of Ontario, Canada, has given to the press an appeal addressed to the electors in which he sets forth the achievements of his government since taking office in 1919 and a declaration of his policy for the future if his government is returned to power at the provincial election to take place next Monday. Of interest to public utility men everywhere are his remarks under the head of "Public Ownership," which follow:

"The government is not opposed to the public ownership of public utilities, nor is it antagonistic to hydro-electric development. Our policy is to give every possible support to undertakings of this nature. We stand for two definite principles which are essential to the success of public ownership—first, for definite responsibility on the part of commissions and others engaged in carrying out public-ownership projects to the government and to the Assembly and through them to the people; second, for such care in the projection and execution of public ownership undertakings as will insure that they shall be entered into only after the most careful and accurate estimates, and that they shall be carried out with such economy as will enable them to attain the utmost of efficiency. It is our policy that each public ownership undertaking shall be self-sustaining and that no such undertaking shall be a burden upon the general taxpayer."

## Quebec Premier on Private Versus Public Ownership

Louis A. Taschereau, Premier of the Province of Quebec, in a recent speech said that the prosperity of the province, and, in fact, of all Canada, depended upon increased production, particularly of goods which would find a ready market in the United States and that this industrial development would require tremendous electrical development.

"There are two systems of developing water power," continued Premier Taschereau. "One is the Ontario scheme, by which the government does the work through the Hydro-Electric Commission, and the other is the system in Quebec, by which the government undertakes no obligation itself, but leaves it to private initiative, with the aid of all possible facilities that the government can grant."

Without criticising the Province of Ontario, he pointed out that it had incurred a debt of $250,000,000 for a population of less than three million people, while the debt of the Province of Quebec, with a population of nearly as much, is only $52,000,000.

"We prefer our system of leaving it to private initiative to develop the water power," said the Premier. "By so doing we shall succeed in bringing many millions of foreign capital into our province. Furthermore, if you leave the development of water powers to private initiative, you are keeping the water powers out of the vicissitudes of politics. A government cannot put the technical knowledge and energy into such development works that can be supplied by a private concern."

## Well-Known Men Win Prizes for Electrified Houses

An entirely new "side issue" at the recent convention of the National Electric Light Association in New York was a contest held under the auspices of the Joint Committee for Business Development to award prizes to those whose houses were most fully electrified. This contest was remarkable for the interest it aroused among well-known men of the industry who were attending the convention. Many of them entered the lists as competitors.

W. D'A. Ryan of the General Electric Company, Schenectady, N. Y., with a total of 343 points, was adjudged winner of the contest. C. W. Stone, also of the General Electric Company, was second with 327 points; Samuel Ferguson, vice-president Hartford Electric Light Company, third with 309 points, and C. L. Edgar, president Edison Electric Illuminating Company of Boston, fourth with 307 points. Then followed W. E. Holmes, Newton, Mass., 273 points; F. B. Steele, Utica, N. Y., 266 points; Thomas W. Drought, Broadalbin, N. Y., 256 points; L. L. Elden, Boston, 250 points; Steele R. Sellers, Pittsburgh, 241 points, and Ralph D. Cutler, Hartford, 231 points. Many others got honorable mention.

The prizes were given by *Electrical Merchandising*, and James R. Strong, A. K. Baylor, R. S. Hale and Miss Alice Carroll were the judges.

## S. P. E. E. Gathers at Ithaca

### Educational Research Project to Be Carried Forward by Director and Advisory Board

ENGINEERING leadership and educational research were leading topics at the annual meeting of the Society for the Promotion of Engineering Education at Ithaca, N. Y., on June 20 to 23. More than 300 leading educators from all sections expressed an enthusiastic desire to carry forward the educational research project formulated by two years' work of the committee of investigation and co-ordination. This calls for the investigation of the objects of engineering education and the best curriculum to attain the desired ends. A director is to be appointed, with an advisory board, and Dr. H. S. Pritchett of the Carnegie Corporation has recommended to his directors and to other foundations the expenditure of $108,000. Action is to be taken immediately by appointing a faculty committee at each school to cooperate with the director.

At the opening meeting on Wednesday afternoon Dean D. S. Kimball gave a notable address on training for leadership. He said that precedents were lacking whereby legal leadership in the nation could codify past experiences and that the present epoch utilized pure and applied science so greatly that the engineer was needed. The fundamental curriculum, he thought, should not be changed as such a practice would undermine the standing of the engineer which has been built up over many years. Hope for solving present problems lies in the application of engineering principles by the industrially intelligent, and the present era calls for universal wellbeing, not private, state or corporate profits. In the opinion of Dean Kimball, the chief trouble with the present curricula as regards training leaders is that they afford no historical background. There is also an insufficient number of inspiring teachers.

Excellent arrangements were made for caring for visitors in the Cornell University buildings, and many entertainment features were provided for the visiting ladies. On Wednesday night President Farrand of the university welcomed the members of the society, and President C. F. Scott of the society responded, after which an informal reception was held.

## Baltimore Rates Reduced

**Maryland Commission Fixes Prices Designed to Save Consumers of Energy $700,000 a Year**

FIXING a valuation of $81,400,000 on the property of the Consolidated Gas, Electric Light & Power Company, which is $31,200,000 less than the figure arrived at by the company's expert, the Maryland Public Service Commission has ordered a reduction in gas and electric rates, effective July 1, designed to save consumers $1,350,000 a year, while still preserving 8 per cent dividends.

A radical cut is made in the gas department, where $650,000 is to be saved to consumers. The 8-cent primary rate for electricity is not reduced. Electric bills of domestic consumers are reduced, however, by cutting the secondary rate from 5 cents to 4 cents and bringing the secondary rate nearer the primary rate. Consumers hereafter will go on the secondary rate after having used 40 kw.-hr. of energy at the primary rate instead of 50 kw.-hr. No reduction was made in the primary rate because it was demonstrated at the rate hearing that this rate was not compensatory and that it actually cost more to serve those whose entire bills fell within it than the amount they paid the company.

The power rates were reduced about 20 per cent. The commission refused to abolish the fuel rate adjustment and the rates will fluctuate, as heretofore, according to the changes in the price of coal. The base rate will, however, change according to the changes in the price of coal above $5 per ton, instead of $2.70 per ton as heretofore, the variation being one-hundredth of a cent for each 9 cents change in the price of coal instead of for each 3 per cent.

Savings to householders in electric bills are expected to amount to $350,000 a year, and savings to users of electricity for power to $350,000 a year.

The commission's action takes from the company a little more than half the amount of its surplus after dividends and all expenses are paid, and, according to members of the commission, divides between the company and its customers the results of prosperity.

In its decision the commission said:

"There were five estimates of value presented to the commission. We have given careful consideration to every item of each. We cannot adopt the company's 'reproduction cost new' appraisal as the rate base. It would be unfair to the patrons and, we believe, unwise for the company to urge it. The banking and investing public would not accept it. From a long experience with the company, and from a study and consideration of the entire testimony, we are convinced that the security issues now outstanding represent par value in property, a belief evidently shared by the banking fraternity and investing groups."

COMPANY TO ABIDE BY ORDER

Herbert A. Wagner, president of the company, gave out this statement:

"The decision of the commission resulting in a reduction of both gas and electric rates amounting in money to $1,350,000 a year (or nearly $4,000 a day) comes after the most exhaustive inquiry into the conduct of our business that has ever taken place. We have no comment to make as to the commission's point of view.

"Baltimore has been enjoying gas and electric rates lower than those in any other city on the Atlantic seaboard. Now they have been made still lower. In fact, the electric rates for domestic and commercial consumers are now made lower than the pre-war rates, in spite of the fact that commodities generally are still at least 60 per cent higher than before the war.

"The reduction in rates is most drastic and such as we could not have anticipated, but we will accept and obey the commission's order in the best spirit we can and, with the continued cooperation of our customers, will do our best to furnish good service at the exceptionally low rates prescribed."

## Stone & Webster, Inc., to Manage Jamaica Public Utility

Stone & Webster, Inc., Boston, have been appointed managers of the Jamaica Public Service Company, Ltd., recently organized by Montreal banking interests to carry on the electric lighting, power and street-railway business of Kingston, the capital and chief town of the British West Indian island. The financing of the new company is being handled by a syndicate headed by Greenshields & Company and including Æmilius Jarvis & Company and Mackenzie & Kingman, all of Montreal. The West Indian Electric Company, Ltd., and the Jamaica Electric Light & Power Company, Ltd., formerly operating in Kingston, have been purchased. The new company will also serve the parishes of St. Andrew and St. Katherine, the territory having a population of 125,000.

Alfred S. Nichols, for the past six years manager of the Paducah (Ky.) Electric Company, has been appointed manager of the Jamaica company, and Roy S. Nelson, formerly chief engineer of the Eastern Texas Electric Company's generating plant at Port Arthur, Tex., will take charge of the generating plants.

## California Oregon Seeks to Acquire Douglas County

The California Oregon Power Company has made application to the California Railroad Commission for permission to exercise an option for the purchase of the plant and properties of the Douglas County Light & Water Company, which is engaged in the business of generating and distributing electrical energy and water in Douglas County, Ore., and Siskiyou County, Cal., for a purchase price of $600,000. The proposed purchase and merger of the Douglas County Light & Water Company is to be made effective as of July 1, 1923. Headquarters of the Douglas County Company are at Roseburg, Ore.; it has a hydro-electric and a steam auxiliary station at Winchester, Ore., and serves a population of more than seven thousand.

## Alabama Power Gross Earnings Increase $1,200,000

Net income of the Alabama Power Company for 1922 was $573,606, after deductions for interest, taxes and depreciation, or an equivalent of $3.06 a share on the $18,750,000 common stock outstanding. The gross earnings were $5,865,906, compared with $4,629,477 for the previous year.

"This increase," the report just issued says, "was due almost entirely to an increased volume of business in both wholesale and retail electric operations, new services to communities and industries and also from the sale of energy to public utility companies in adjoining states. There was no material increase in the street-railway and gas earnings."

Net operating revenue for the year 1922 was $5,745,320, while net earnings from operation were $2,750,721.

## Indianapolis to Have Large Automatic Substation

A large automatic direct-current substation will soon be in operation by the Indianapolis Light & Heat Company in a remodeled substation building in the rear of the company's offices. The substation, which will contain three motor-generator sets, will have a capacity of 4,000 kw. Two new units that have been put in place recently have a capacity of 1,500 kw. each, and an old unit of 1,000 kw. has been included in the new system. The substation improvements were made at a cost of approximately $700,000.

The machines start and stop themselves as the consumption of energy on the lines justifies an increased or decreased load. In case of mechanical trouble within a machine, such as an overheated bearing, it stops automatically and relays ring a bell, notifying attendants that something is wrong with the equipment. If any part of one unit should become inoperative, the machine is brought to a stop and an undamaged unit is automatically started. The new units will attain the maximum load in twenty seconds from a dead start, whereas the old type of machines require from three to four minutes.

Charles C. Perry, president of the company, said that the substation is to be made a battery-protected station. The battery equipment has been ordered and will be installed in a few months. This will give the company four battery-protected substations to insure against interruption of service in that part of the city receiving direct-current service. In addition to the four battery-protected and direct-current substations the company operates two substations that do not have the battery equipment.

In the past year the company has spent more than $1,000,000 in making additions to its direct-current equipment. Mr. Perry said that underground lines have been placed in the business district which will meet the requirements of a city of a million population. The capacity of the direct-current substations has been increased practically one-third by the improvements.

# Louis Bell Dies at His Home

## Distinguished Electrical Engineer, Authority on Power Transmission and Illumination, Passes Away at West Newton, Mass., at the Age of Fifty-eight

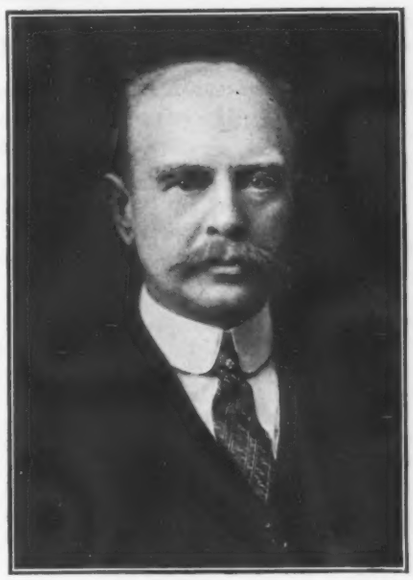
ELECTRICAL engineering suffered another loss on Thursday, June 14, when Dr. Louis Bell, well-known consulting electrical engineer of Boston, died at his home in West Newton, Mass., at the age of fifty-eight. Dr. Bell had been in poor health for some time, and the news of his death, lamented as it was, was not unexpected by his friends and associates. Simple funeral services were held at his home on Saturday, attended by many prominent in electrical and professional circles from Boston and elsewhere.

Louis Bell was born on Dec. 5, 1864, in Chester, N. H. He was graduated from Dartmouth College in 1884 and received the degree of Ph.D. from Johns Hopkins University in 1888, after specializing in physics. In the latter year he joined the faculty of Purdue University at Lafayette, Ind., as professor of physics and applied engineering. Here he organized the department of electrical engineering. In 1890, after a year of engineering practice in Chicago, he became editor of the ELECTRICAL WORLD, retaining that post until 1892, when he resigned to become chief engineer of the newly organized power transmission department of the General Electric Company. His pioneer work in this connection was of the greatest importance in placing this branch of the art on a commercial and an engineering basis. As engineer for the General Electric Company he designed and installed at Redlands, Cal., in 1893 the first three-phase transmission plant for general service. He also installed at Taftville, Conn., the first polyphase transmission plant for cotton-mill drive and for electric railway operation. In 1894 he took charge of the General Electric power work in the Chicago territory, removing to Boston in the following year to establish his own office. From 1895 to 1905 he lectured on power transmission at the Massachusetts Institute of Technology.

### HIS DUAL FIELD

In addition to his work on the transmission of power, Dr. Bell early specialized in illumination problems, coordinating the study of electric lighting with that of optics. In each of these important fields—power transmission and illumination—he produced the earliest standard treatise published in America. His "Electric Power Transmission" (1897) stood as authority for years and was translated into French and German, and his "Art of Illumination" (1902) was the only available volume on illuminating engineering for a long time after its publication. Since 1914 he had lectured on public lighting at Harvard University and on illumination at Harvard Medical School.

Other books of which Dr. Bell was the author are: "The Electric Railway" (1892), with Oscar T. Crosby; "Power Transmission for Electric Railways"



DR. LOUIS BELL

(1896) and "The Telescope" (1922). He was a prolific contributor to the technical press. He supplied the article on "Illumination" in the "Standard Handbook for Electrical Engineers," that on "Power Houses" in the Encyclopædia Americana and those on "Electric Power Transmission" and "Electric Motors" in the tenth and eleventh editions of the Encyclopædia Britannica. His impartiality as between his two chosen subjects is shown by the titles of some of his contributions to societies and periodicals. These include "Absolute Wave Length of Light," *Philosophical Magazine* (1888); "Practical Properties of Polyphase Apparatus," *Transactions* A. I. E. E. (1894); "Physiological Basis of Illumination," *Proceedings* American Academy of Arts and Sciences (1907), and "Star Colors, a Study in Physiological Optics," *Astrophysical Journal* (1910). He had been a regular contributor to the ELECTRICAL WORLD for many years, both editorially and over his own name. His journalistic work, done under high pressure as most of it was, displayed, nevertheless, when at its best, not only his mastery in his chosen fields, but an ability seldom possessed by engineering specialists to impart a graphic touch to a technical subject without wandering from it, and even, without the loss of dignity, to bring a smile to his readers by an occasional humorous sally couched in the passing vernacular of the day.

### HIS MANY AFFILIATIONS

Dr. Bell took out forty patents relating to power transmission and optical apparatus. He was a past-president of the Illuminating Engineering Society, a member of the American Institute of Electrical Engineers, of which he was a manager in 1891-94; a member of the International Electrotechnical Commission and the International Illumination Commission, and a fellow of the American Academy of Arts and Sciences. He received from British illuminating engineers the compliment of being made a vice-president of the Illuminating Engineering Society of London. He was secretary of the power transmission section of the International Electrical Congress held at St. Louis in 1904 and for six years (1895-1900) was chairman of the incandescent-lamp committee of the National Electric Light Association. In 1908 he undertook a roving commission in Europe for the Edison Electric Illuminating Company of Boston, studying the developments in lighting in many cities.

Dr. Bell had a profound knowledge of spectroscopy, alternating-current phenomena, wireless telephony, illumination in all its phases, physiological optics, the physiological interpretation of albedo and oculars. In the world war he was a member of the advisory committee of the Council of National Defense and in collaboration with Norman Marshall of Waltham, Mass., invented a system of signaling by ultraviolet rays which enabled dots and dashes to be transmitted invisibly to the enemy but with accurate reception for several miles by forces provided with the proper apparatus. This important contribution to the art of war was delayed in reaching the front by causes beyond the control of the inventors, although it is understood that it was successfully tested in the zone of advance and would have found widespread use had hostilities continued. His versatility was further shown by his interest in the technique of ordnance. He was a past-president of the Massachusetts Rifle Association. He invented a rifle sight which was used in the late war. His last research work was done in connection with the Sperry searchlight in the detection of helium.

For more than twenty-seven years Dr. Bell had carried on a consulting engineering practice in Boston, leaving design and construction to others and devoting himself to giving the advice and professional opinions that his acquirements so well fitted him to render. He was married in 1893 to Sarah G. Hemenway of Somerville, Mass., who, with a son, survives him.

## Pacific Coast Men Meet

**Interesting Employees in the Association—Promoting Electric Trucks —Western Development**

THE seventh annual convention of the Pacific Coast Electrical Association opened on Tuesday of this week at the Fairmont Hotel, San Francisco, with a big electric truck demonstration. Following a parade in which 116 electric trucks participated, the five hundred convention delegates and the members of the San Francisco Development League gathered for lunch and to hear several short talks on electric trucks. One of the largest users of these trucks in San Francisco stated that the delivery costs of his firm had been reduced more than 50 per cent since the discarding of gasoline trucks.

The most important thing the association has accomplished in the past year, said President James B. Black, is the reviving of the interest of the employee or class B members. The convention this year was being held in a large city to afford many members of this class an opportunity to attend and do some real work themselves, something to make the association worth while to them. The association, President Black said, is endeavoring to work from the bottom up instead of from the top down. This policy has borne fruit in the intensive work done by the Commercial and Technical Sections.

### Western Development Conference

A special effort was put forth this year to make the "Western development conference," which was held on Friday, a big success. The association felt that it could profit by calling in men from the outside to discuss problems of mutual interest. The program of the conference included addresses by Willis Booth, president of the International Chamber of Commerce and vice-president of the Guaranty Trust Company of New York, who was to speak on "The Importance of the Pacific Coast in World Affairs"; Paul Shoup, vice-president of the Southern Pacific Company, whose subject was to be "The Effect of Government in Business on the Progress of the Country," and D. H. Botchford, vice-president and general manager of the Columbia Steel Company, to whom was assigned "The Steel Industry as a Basic Industry in the Development of the West."

The convention program this year was a departure from the usual type in that a few short crisp papers were presented instead of the usual committee reports. These papers were on correlated subjects to those studied by the committees during the year, and the interest taken in them stamped the plan as a success.

## Electrical Exhibit to Go to Small California Towns

The California Co-operative Campaign decided on an enlarged program at its executive committee meeting on Monday of this week held just prior to the convention of the Pacific Coast Electrical Association at the Fairmont Hotel, San Francisco. A pullman car and baggage car are to be purchased. The pullman will be equipped as a complete electrical home and the baggage car will be fitted out to show the possibilities of the use of electricity on the farm. These cars will be taken to all the smaller towns and communities of the state where it is not practicable to establish a regular "electrical home." The baggage car will be patterned after the cars exhibited by the farm bureau of the agricultural department of the University of California, which exhibited such cars throughout the state as far back as 1912 with great success. The cars will be painted yellow and named "California No. 1" and "California No. 2." It is planned to turn them over to the N. E. L. A. or some other national organization to be used to spread the electrical message all over the country.

The Co-operative Campaign will put on an additional field man, who will work largely among the architects and builders in the San Joaquin and Sacramento valleys. Two other field men will be added, one to work in the Los Angeles and the other in the San Francisco territory. These men will work among the contractor-dealers and other electrical distributing agencies to spread the message of co-operation and to establish a closer relation between the campaign and these branches of the industry.

The first half of the campaign's program for ten electrical homes in the state during the year has been completed. Five more homes will be shown in various cities during the remainder of the year.

# No License to Alabama Power for Lock 17

**Federal Commission Defers Action Because of Protest from Congressmen—Decisions Are Made on Many Applications from California and Other States**

PROTESTS from Representatives Almon, Jeffers and Bankhead of Alabama have caused the Federal Power Commission to withhold action on the application of the Alabama Power Company for a license covering the development of 5,000 hp. at United States Lock and Dam No. 17 on the Black Warrior River. (See ELECTRICAL WORLD for May 5, page 1051, and May 26, page 1229.) The position of the Alabama Representatives is that the State Public Service Commission is considering the issuance of a certificate of convenience and necessity. It is known, however, that the Alabama Representatives mentioned are opposed to any plan whereby the Alabama Power Company will secure a foothold on the Warrior River. They hope that a competitor for the Alabama Power Company will eventually be found through the disposition of Muscle Shoals and the Gorgas and Sheffield steam plants, and they would hold open for that interest such power as can be developed on the Warrior.

### The High Dam at Merced

The commission has authorized the issuance of a license to the Merced Irrigation District of California covering a power and irrigation project on the Merced River in that state. Before issuing the license, however, the commission will investigate the safety of the design proposed. The arch structure is somewhat higher than anything which has been attempted heretofore.

### Snake River Transmission Lines

In authorizing a license to the Idaho Power Company covering the thirty transmission lines which connect its power stations on the Snake River with their load points, the commission will regard this network of lines—which have an aggregate length of a thousand miles—as a major project. As a rule transmission lines are handled rather perfunctorily as a minor part of a project. The commission's decision will make it necessary for the power company to furnish much more complete information than otherwise would be the case. About 30 per cent of the transmission line mileage is on public lands.

### Kern River License Withheld

In connection with the application of the San Joaquin Light & Power Corporation for a license covering a construction project on the Kern River the commission decided to withhold action until complete information is available with regard to the status of lands within the project area.

### Intercompany Dispute

There also is a controversy in progress between the San Joaquin corporation and the Southern California Edison Company with regard to the level of the pool above the San Joaquin corporation's diversion dam. The Southern California Edison Company has agreed to a level of 948 ft. above sea level, provided the San Joaquin company agrees to draw down this pool temporarily whenever requested to do so, to enable the Southern California Edison Company to make repairs to its plant. The San Joaquin interests are unwilling to make such an agreement.

### Licenses and Decisions

A license has been authorized for the Southern California Edison Company covering its Borel plant on the Kern River. This license was adjudged necessary in a recent opinion of the Supreme Court of the United States.

Permission to relocate 10 miles of its main transmission line between the Sierra Mountains and Imperial Valley has been extended to the Southern Sierras Power Company, so as to make the line follow the public highway.

Permission also was granted the company to build a 3-mile branch from its Palm Spring transmission line.

The city of Los Angeles has been denied rights on the Kings River. This proposed development is in the area suggested for inclusion in the Roosevelt National Park. The commission has also rejected the application of the San Joaquin Light & Power Corporation for rights on Bubbs Creek and Roaring Fork.

The Burbank Irrigation District will be allowed to place a temporary dam in the Snake River subject to the conditions which the Chief of Engineers has prescribed.

A license has been authorized for a 250-hp. project on Elk Creek in Idaho County, Idaho. The power is to be used for mining purposes by the Unity Gold Mines Company.

A license has been authorized for the Michigan Hydro-Electric Power Company of Three Rivers, Mich. It covers a project on the St. Joseph in southern Michigan.

The commission has authorized a license for the Houston Power Company covering a development on the Choctawhatchee River near Newton, Ala. The company propeses to construct a 50-ft. dam and install machinery capable of generating 5,000 hp.

Permission has been granted the Alabama Interstate Power Company to transfer to the Alabama Power Company the license covering its Cherokee Bluffs development.

### Preliminary Permits

The commission has authorized the issuance of these preliminary permits:

The Yosemite Power Company, Groveland, Cal., two developments on the Tuolumne River. An application for a permit covering a lower site was denied since it might interfere with the Hetch Hetchy water rights.

The Susquehanna Power Company of New York, covering the proposed 360,000-hp. development on the Susquehanna at Conowingo, Md.

### Other Actions

The Marianna (Fla.) Light & Power Company has announced its intention to develop a power project in the Chipola River, near Marianna. The commission has accepted jurisdiction.

The commission has authorized the executive secretary to prepare a condensed classification of accounts to be used by licensees not furnishing public service. These include mining companies, manufacturers and other industrial licensees. It also has authorized the executive secretary to act on behalf of the commission in the amending of licenses to embody minor changes in plants.

## Preliminary Permit Granted for Flaming Gorge

Despite the delay in ratifying the Colorado River treaty, which has held up action by the Federal Power Commission on many projects, a preliminary permit has finally been granted to the Utah Power & Light Company by the commission for its Flaming Gorge power development on Green River. The company is starting a preliminary survey and making plans for the construction of a 60,000-hp. plant and dam. An expenditure of $10,000,000 and the employment of a thousand men for three years when the final license is granted are involved. The site is 5 miles south of the Wyoming line in Utah, about 125 miles east of Salt Lake City.

## Commission May Now Act on Colorado River Projects

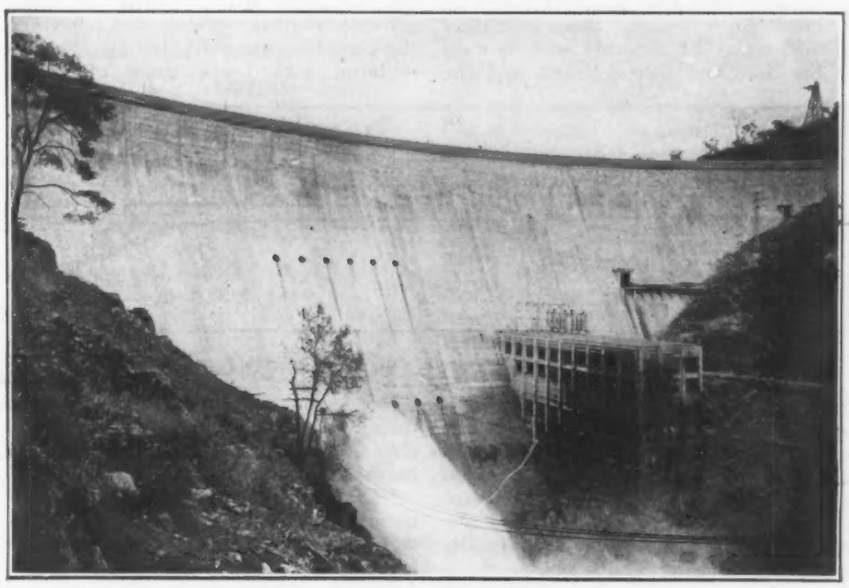
By granting a preliminary permit to the Utah Power & Light Company covering its Flaming Gorge project on Green River the Federal Power Commission has inserted the thin edge of the wedge which is expected to lead to action on the Colorado River projects. Regardless of what Arizona may do with regard to the ratification of the Colorado River compact, it is believed that the commission will this fall award the Girand license covering the large development proposed at Diamond Creek. It is believed that the upstream states could not insist successfully that the Arizona project be held up when they have urged the granting of the Flaming Gorge permit. Prominent officials of both Utah and Colorado are now on record as urging in very vigorous fashion the granting of that permit.

The load of the Utah Power & Light Company has been increasing at such a rate that a steam auxiliary must be put into operation in the near future. Unless the Flaming Gorge development is allowed to proceed as rapidly as possible, it will be necessary to construct additional steam units. It is to avoid this latter situation that so much pressure has been brought to permit the company to proceed with its foundation explorations at Flaming Gorge.

## Power and Irrigation

**Plant of Modesto-Turlock Irrigation District in California Distributes Energy as By-Product**

THE Don Pedro power plant of the Modesto-Turlock Irrigation District is the most recent hydro-electric plant to be placed in operation in California. This is a combination irrigation and power development costing $4,730,000, carried out primarily to increase water storage for irrigating 150,000 acres of land in the San Joaquin Valley. A power plant was built at the dam to utilize the head created and generate power from the water released for irrigation. The dam and power house are about 40 miles up the Tuolumne River from Modesto, Cal. The dam is of the concrete-arch type, 283 ft. high, creating a storage reservoir of 289,000 acre-ft. This storage will lengthen the irrigation season 40 per cent.



DAM AND POWER HOUSE AT DON PEDRO, CAL., ON THE TUOLUMNE RIVER

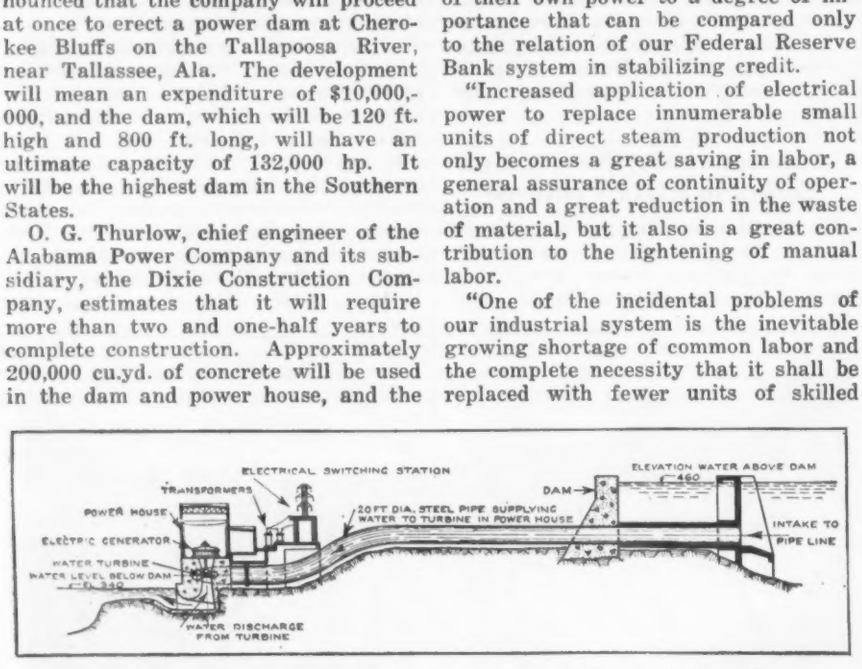
### Present Capacity 12,000 Kw.

The power house, built on the downstream face of the dam, has a present equipment of three 4,000-kw. generators. The turbines are designed for variable-head operation. The efficiency is 91 per cent at 120 ft., the lowest head, and 83 per cent at 240 ft., the maximum head. The capacity at the low head is 62 per cent of full-load rating. Power is transmitted down into the valley over a 33-mile twin-circuit steel-pole transmission line at 66,000 volts. The Turlock district receives two-thirds of the power and the Modesto district one-third. Both districts are building distribution lines and will sell all power in excess of the requirements for pumping. The Turlock district already has many miles of distribution system and plans to build up a large range, water-heater and house-heating load. Rates for electric service are based on the "readiness-to-serve" theory.

## Ready to Start the Dam at Cherokee Bluffs

Following the approval of the Alabama Public Service Commission, Thomas W. Martin, president of the Alabama Power Company, has announced that the company will proceed at once to erect a power dam at Cherokee Bluffs on the Tallapoosa River, near Tallassee, Ala. The development will mean an expenditure of $10,000,000, and the dam, which will be 120 ft. high and 800 ft. long, will have an ultimate capacity of 132,000 hp. It will be the highest dam in the Southern States.

O. G. Thurlow, chief engineer of the Alabama Power Company and its subsidiary, the Dixie Construction Company, estimates that it will require more than two and one-half years to complete construction. Approximately 200,000 cu.yd. of concrete will be used in the dam and power house, and the largest body of water in the state will be formed when a reservoir of 22,500 acres, containing 25,000,000,000 cu.ft. of water, is backed up by the dam. Mr. Thurlow stated that the structure would be of a type popular in the Western States, but little used in the South. The power house will be built down stream from the dam instead of as an integral portion or on the upstream side, and the water will be conducted through penstocks leading from the dam above. Three units, generating 44,000 hp. each, are to be installed, and two of these will be placed in service as soon as possible.




CROSS-SECTION SHOWING PLAN OF CHEROKEE BLUFFS DAM AND POWER HOUSE

Much of the equipment used in building Mitchell Dam will be transported to Cherokee Bluffs, saving it from deterioration through idleness. The nucleus of the executive force which built Mitchell Dam has been retained and will be used in the new project. Cherokee Bluffs is in the center of a triangle formed by Montgomery, Alexander City and Dadeville, Ala.

## Hoover for Expansion of Electric Industry

"Further great application of electricity is one of the surest roads, not only to elimination of waste in industry, but to the stabilization of industry itself," Secretary Hoover said recently when interviewed at Washington. "Beyond this the enlarged scale of generation, distribution and reinforcement of reserve supplies of electrical power, spread over large areas, makes for continuity in industrial production such as cannot be secured in any other way.

"The growing interconnection of existing power systems and their reinforcement with larger centralized production units will serve further to assure the productive industries stability of their own power to a degree of importance that can be compared only to the relation of our Federal Reserve Bank system in stabilizing credit.

"Increased application of electrical power to replace innumerable small units of direct steam production not only becomes a great saving in labor, a general assurance of continuity of operation and a great reduction in the waste of material, but it also is a great contribution to the lightening of manual labor.

"One of the incidental problems of our industrial system is the inevitable growing shortage of common labor and the complete necessity that it shall be replaced with fewer units of skilled labor, performing the laborious task of the many. The more general spread of electrical power is inevitable for this reason, if for no other.

"The time is ripe for a general national program of superpower development. The stretch of economic transmission distances has brought power development from the mouth of our coal mines and from streams to within the economic reach of our industrial centers and our farms."

## Aims of New York Electrical Board of Trade

The board of governors of the Electrical Board of Trade of New York City at a meeting held June 20 accepted the following twenty tentative statements of the specific aims of its organization:

1. To represent the entire electrical industry of New York City in all matters of legislation, city departments, underwriters, etc., and to see to it that the interests of the electrical industry are safeguarded.

2. To co-ordinate generally all the activities of the various branches of the industry in order that no individual branch shall engage in any activities that would interfere with or demoralize any other branch of the industry.

3. To provide a method of co-operative and co-ordinated advertising with a view to accomplishing more far-reaching results and, at the same time, economize in expenditure.

4. To take up the problems of business and distribution of the individual branches of the industry through the board of governors, where all sides can be heard and where a proper disposition of the problems may be made.

5. To maintain a complete record of articles and of materials manufactured or dealt in, not only by members, but by all manufacturers and dealers, no matter where located.

6. To establish a bureau of employment so that any competent person from office boy to president may file an application for employment with the bureau, thus saving both employee and employer time and money in finding each other. The plan further contemplates that a reference from the board would be a thoroughly investigated reference and one that could be entirely relied upon.

7. To establish methods of carrying on the various types of business with a view to stabilizing conditions; i.e., attempting to see to it that methods of doing business are of such a type as to meet with the approval of the public at large, it being distinctly understood that this does not in any way mean the fixing of prices or the maintaining of any form of combination.

8. To maintain a complete and up-to-date mailing list subdivided according to types of business and territory with all the machinery for rapidly and economically distributing information, the idea being that, instead of each member being compelled to assemble and maintain an expensive mailing list, this work could be taken over by the board and the mailing out of materials be handled by the board for the members.

9. To establish a credit department for furnishing general credit information to the members, preferably the taking over of the present New York Electrical Credit Association and organizing it as a department of the board under the present credit manager, thus eliminating one set of expenses and expanding the work of this credit association to cover the membership of the board without additional expense.

10. To establish a bureau so that unknown inventors, who are now unable to market their inventions, may file description of the same with the board, and to appoint an experienced committee of the board, equipped with the knowledge of persons in the industry who might be interested in such inventions and would attempt to bring inventors and interested concerns together.

11. To establish a standing arbitration committee, consisting of the best judicial minds in the various lines of the industry, so that a controversy or disagreement between any members or between members and those not members could be quickly referred to three such arbitrators, thereby having differences settled by men skilled in the line in which the controversy arises, these men having a knowledge of every angle and ramification of the business.

12. To establish a bureau so that any member with a surplus of raw or finished materials could be brought in touch quickly with those in need of such materials.

13. Establishing an advisory committee of experienced and competent business men in the line to give business advice to such concerns as might apply for such advice, or even, possibly, citing a concern before such committee if, in the judgment of the board, it is necessary to do so for the benefit of the industry.

14. To remedy and improve the present bankruptcy methods and laws which now result almost invariably in a complete loss of property to the creditors with a gain only to certain types of attorneys; i.e., to establish machinery for economically and properly handling business failures in the industry.

15. To maintain a bureau for statistical information as to volume of business of various kinds in sight, conditions of the raw and finished material markets, etc.

16. To maintain a permanent exposition of interesting modern electrical devices and also, if possible, to maintain a museum covering the original models and early inventions so as to preserve such materials for the generations to follow.

17. To maintain a bureau of investigation of illegal businesses and particularly to follow up, expose and punish those lending themselves to the furthering of the sale of stolen materials and to so-called dishonest failures.

18. To make the Electrical Board of Trade the headquarters not only for New York men and members, but the New York headquarters for all in the electrical industry, no matter where located.

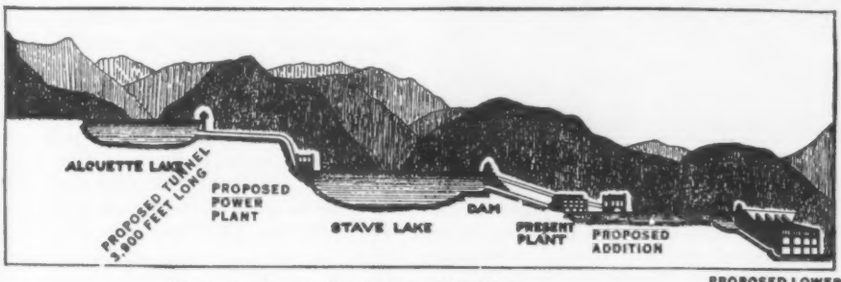
19. To establish a standing in the electrical business community for all firms holding membership in the Electrical Board of Trade and to bring about as rapidly as possible a condition where no firm or corporation can remain a member that does not conduct its business affairs and its relations with members or the public along lines of fair dealing and sane business and in a way to reflect creditably upon the industry.

20. Finally, to set up in the city of New York an institution, representative of the best talent and brains of the electrical industry, in both a technical and business way—an institution so representative of the electrical industry that citizens will recognize it as such and point to it with pride.

## Stave River Development

**By Means of Tunnel from Alouette Lake British Columbia Company Plans to Develop 115,000 Hp.**

PLANS are announced by the British Columbia Electric Railway Company of Vancouver, which owns the Vancouver Power Company and the Western Power Company of Canada, supplying electric light and power to the city of Vancouver and other cities and towns in the Pacific province, for a power development of 115,000 hp. on the Stave River. This power is to be generated in three plants, the construction of which will be extended over a period of five to ten years. It is anticipated that the expenditure will be in the neighborhood of $10,000,000. The present Stave Falls plant was built by the Western Power Company and taken over by the British Columbia Electric Railway Company after its absorption of the former company in 1920. This plant has an installed capacity of 52,000 hp., the fourth unit, which brought the plant up to capacity, having been installed by the British Columbia Electric Railway Company in 1922. During the last year work has been going on raising the present dam and building a new dam at the Blind Slough, which will increase the water storage 50 per cent at a cost of $1,000,000.




PLAN OF STAVE RIVER DEVELOPMENT

Adjacent to Stave Lake lies Alouette Lake, distant about half a mile at its upper end. The water rights on Alouette Lake have been held by the Burrard Power Company, a subsidiary of the British Columbia Electric Railway Company. It was originally intended to develop power by means of a dam and flume, but with the acquisition of the Stave River watershed it is now proposed to tunnel between the two lakes, building a dam at the lower end of Alouette Lake and diverting the water by means of Stave Lake and River.

This diversion is at present the subject of an application before the provincial authorities, and if permission is given, a power house will be built at the mouth of the tunnel on Stave Lake. This plant will use a head of approximately 140 ft. and will generate 10,000 hp. Although plans are not definitely made, it will probably operate on a load factor of more than 80 per cent.

The second undertaking under the proposed scheme will be the addition of a fifth unit to the present Stave Falls plant, which will be made possible by the diversion of Alouette Lake water. Operating at a lower load factor than the Alouette Lake plant, 25,000 hp. will be developed.

Three miles below the present Stave Falls plant a third plant will be built, to be known as the lower development. At this site it is estimated that a plant of 80,000 hp. can be erected. The total flow from Stave Lake to tidewater will be made use of in the present power house and in the lower development. The upper plant now in operation utilizes a 150-ft. head and the lower plant will utilize the rest. Construction work on the Blind Slough dam is going on under the direction of R. S. Kelsch of Montreal, consulting engineer. E. E. Carpenter, formerly of the firm of Baker & Carpenter, San Francisco, has recently been appointed chief electrical engineer for the company, and he will have immediate superintendence of the proposed new work.

## How Municipal Plants Dwindle in Oklahoma

During the last year municipally owned electric light plants have had a thorough test in Oklahoma, and it is regarded as significant that ten of the plants in that state that were sold or abandoned were municipally owned. These towns decided to dispose of their city-owned plants and take energy from central-station companies.

Among the towns finding municipally owned plants unsatisfactory are Okemah, which has signed a contract with the Oklahoma Gas & Electric Company; Heavener, which sold its plant to the same company; Hunter, Billings, Watonga and Geary, which gave up municipal plants to take service from the Oklahoma company; Boswell and Soper, which signed a contract with the Public Service Company of Oklahoma; Ramona, which voted to abandon its municipal plant to receive service from the Sand Springs Power, Light & Water Company; Wapanucka, which sold its plant to the Public Service Company of Oklahoma, and Pawhuska, which was connected with the high-tension line of the Sand Springs company.

Norman and Lawton also abandoned their municipal electric lighting projects and are buying energy from the Oklahoma Gas & Electric Company. Eldorado a few weeks ago completed a high-tension line to the plant of the Quanah Light & Ice Company at Quanah, Tex., and Purcell is now negotiating for electricity over a line which is to be extended south from the town of Norman and through Noble to Purcell.

## Electrical Contractors Listen to Prominent Speakers

The Eastern division of the Association of Electragists International had its annual meeting in Pittsfield, Mass., June 14, when electrical contractors from the New England States, New York, New Jersey, Pennsylvania, Delaware and Maryland to the number of 150 gathered at the Maplewood Hotel.

Charles L. Edgar, president Edison Electric Illuminating Company of Boston, spoke on the selling of electrical service, saying that the lack of knowledge on the part of the ordinary central-station man as to the work of the contractor and the needs of his business is due to lack of association and contact. The central station, he said, should sell appliances on a price basis that will maintain an ample profit for other dealers. Great good could be done by developing the consulting function of the contractor.

Alice Carroll, a representative of the Society of Electrical Development, offered suggestions on providing good service after the sale is made. Charles L. Eidlitz, commissioner of electrical service for New York City, took as his subject "Back to Quality, Sane Costs and Fair Dealing." He explained the manner of regulating submission of bids, which is said to have met with favor with contractors and city officials, as based on exact understanding of the various items entering into a bid. The plan was interpreted at further length by Lawrence W. Davis, director of the association's department of development, whose address was on "Estimating and Selling the Job." Following these addresses the open and closed shop divisions held conferences.

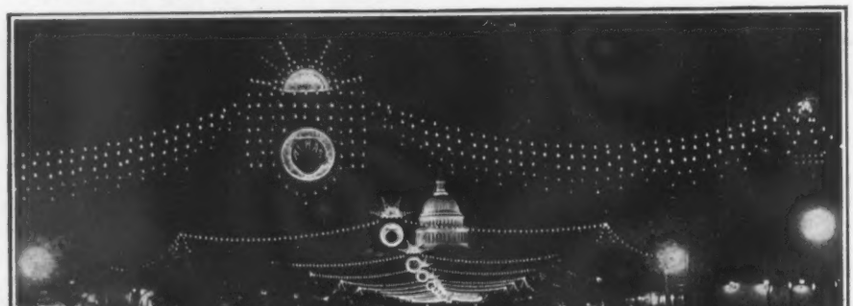
At the evening banquet President James R. Strong was the principal speaker. He urged fuller co-operation among the association members and also with other national organizations, like the plumbers' and steamfitters', whose work touches closely that of the electrical contractors.

## Fraud Charged in Expending Chicago Lighting Funds

George E. Carlson, Commissioner of Gas and Electricity for the city of Chicago, and five others have been indicted by a special grand jury, charged with criminal conspiracy to defraud the city in the expenditure of funds appropriated to the city lighting department. The charges, which are brought by the Citizens' Association of Chicago, allege depredations to the extent of $250,000, mostly caused, it is said, by having the city pay for material which was not delivered. It is further charged that the Commissioner has wasted about $200,000 of the $305,000 he has so far expended out of the proceeds of the two-million-dollar bond issue voted by the people in June, 1922, for the extension of the city's lighting system.

## Electricity at the Shriners' Convention

When the Knights of the Mystic Shrine gathered at Washington this month Pennsylvania Avenue from the Capitol to the Treasury Building, walled in on both sides by buildings bedecked with flags and festoons, presented at night a veritable ceiling a mile long of lights, red, green, yellow and white, divided at intervals by curtains of light extending below the main canopy. More than thirty-seven thousand lamps were used in the decorations, which cost $50,000. Pennsylvania Avenue was the "Road to Mecca," and Lafayette Square, the "Garden of Allah," was beautifully illuminated as a court of honor. The floodlighting of prominent buildings by means of powerful lamps and projectors also added greatly to the brilliant spectacle presented by the city as a whole. The plans were worked out by the Illumination Bureau of the Westinghouse Lamp Company.



©Westinghouse Lamp Company

## Engineers Discuss Standardization Plan

At the regular quarterly meeting of the main committee of the American Engineering Standards Committee, held June 15, at the Engineers' Club, New York, the chief matter of interest was a discussion of the new standardization project of the Department of Commerce. Dr. A. S. McAllister, who is to have charge of this work and who until recently has been on the staff of the American Engineering Standards Committtee as liaison officer of the Bureau of Standards, was present and outlined Secretary Hoover's plans.

The plans contemplate collecting information with regard to existing specifications for the purchasing of commodities and making this information and such specifications available to government departments and state and municipal authorities. In the opinion of the A. E. S. C. this work will have a stimulating effect upon the whole standardization movement and will result not only in a larger use of specifications but in a larger demand for the authoritative standards that are now being developed under the auspices of the federal specifications board and the committee.

# Brief News Notes

**Sioux City Extensions.**—Improvements totaling $3,000,000 are soon to be started by the Sioux City Gas & Electric Company. This includes the plans for a generating station to cost $2,500,000. The plant will contain two turbogenerators rated at 10,000 kw. each.

**Effort to Electrify Railroads in St. Louis.**—The Director of Public Safety of St. Louis is conferring with the traffic committee of the Chamber of Commerce upon an ordinance to compel the electrification of all railroads entering St. Louis. This action is to be taken to aid in abating smoke, and a law similar to that passed by the New York State Legislature to force electrification in Greater New York is favored.

**Rumored Mexican Development.**—Purchase has just been made of extensive water-power rights in the State of Vera Cruz, Mexico, near Orizaba, by Allen Rantell of London, England, and associates. It is asserted that this transaction is preliminary to the construction of one or more large hydroelectric plants which will furnish power for industrial concerns within a radius of more than a hundred miles.

**Public Service Corporation of Quebec to Become Quebec Power Company.**—Shareholders of the Public Service Corporation of Quebec, a subsidiary of the Shawinigan Water & Power Company, have ratified bylaws providing for changing the name to Quebec Power Company and increasing the capital from $3,000,000 to $10,000,000. This company is expected to absorb the Quebec Railway, Light, Heat & Power Company, which it now controls.

**"New York in 1923."**—An unusually attractive souvenir under this title was presented by the New York Edison Company to the delegates at the recent convention of the N. E. L. A. It was got up in very attractive form and contained many artistic photographs not only of familiar places in the city but the unfamiliar ones as well. The great majority of the pictures were taken by the company's own staff of photographers, though there were a few by Van der Weyde.

**New England Power Company to Furnish 12,000 Kw. to Steel Corporation Subsidiary.**—The American Steel & Wire Company, a subsidiary of the United States Steel Corporation, which has been purchasing part of its power during the last ten years, has recently signed a contract with the New England Power Company whereby it will purchase all of its power with the exception of that used in its steel rolling mills. This load is expected to average about 12,000 kw.

**Southern Minnesota Absorbs Spring Valley Utility.**—The Southern Minnesota Gas & Electric Company announces the purchase of the Northwest Utilities Company of Spring Valley, Minn. This adds twenty-two to the chain of towns now served by the Southern Minnesota company, making a total of about sixty-five communities in southern Minnesota and northern Iowa. The twenty-two towns will add four thousand customers to the company's list.

**Rice Lake, Wis., to Purchase Central-Station Plant.**—In accordance with a vote of its citizens registered three years ago, the city of Rice Lake, Wis., is at length about to issue bonds to take over the local electric light and power plant of the Wisconsin-Minnesota Light & Power Company. The property was appraised by the Railroad Commission in August, 1922, at $233,000 and, with subsequent improvements, is valued at approximately $250,000. The city owns much of the lighting equipment and also an auxiliary power generating plant operated by steam.

**Appalachian Water Power Conference.**—With at least one hundred New England cotton-mill owners invited to be present and the question of a survey of the French Broad River as one of the main topics, no little interest attaches to the second annual conference of the Appalachian Water Power Conference to be held in Asheville, N. C., June 25, 26 and 27. A federal appropriation of $200,000 is available for surveys in the Appalachians. The Asheville Chamber of Commerce is endeavoring to secure pledges that if the survey of the French Broad is made the recommendations will be carried out.

**Movement to Abolish Oklahoma Commission.**—A movement for the abolition of the Corporation Commission of Oklahoma was started when initiative petitions for this purpose were filed with the Secretary of State on June 1. The movement is backed by the Farmer-Labor-Reconstruction League and the farm-labor group, which is active in all the state departments. The proposed amendment would substitute for the Corporation Commission a commissioner of railroads and warehouses, who would be elected for four years with a salary of $5,000 a year.

**La Crosse Must Wait for Commission to Fix Rates.**—Efforts of the La Crosse (Wis.) municipal government to speed

up a change of the local electric light and power rates by injunction proceedings came to naught recently in the Wisconsin Supreme Court when that tribunal handed down a ruling that the city has no cause for action against the Wisconsin-Minnesota Light & Power Company pending a revision of rates by the Railroad Commission. When the court held the "loop" system of rates to be unlawful, the city set out to get a court ruling which would require the local company to use the rate in effect in October, 1920, before the "loop" rate was applied.

**Work Begun on Turner Shoals (N. C.) Project.**—The second water-power development recently announced by the Blue Ridge Power Company is now under way on Green River, in Polk County, N. C., where a large force of men is at work excavating for the dam, which will form a lake covering 400 acres and be slightly larger than the Lake Summit development at Tuxedo, several miles above on the same stream. The new development, which will be known as Turner Shoals, is on Green River just above where the highway from Tryon to Chimney Rock crosses the river. The company expects to develop 10,000 hp., and the project involves the expenditure of approximately $1,000,000.

**Westinghouse Units for Kearney Plant.**—The two turbine generators ordered by the Public Service Production Company from the Westinghouse Electric & Manufacturing Company for the mammoth new plant at Kearney, N. J., will be of the standard Westinghouse high-pressure condensing type, designed to deliver 40,000 kw. maximum with high-pressure steam at 325 lb. gage, 270 deg. superheat and 28.5 in. vacuum. They will be supplied with four bleeder openings each for the purpose of bleeding out steam to heat the condensate for boiler-feed water. The generators will be for 35,000 kw. at 80 per cent power factor and will be wound for three-phase, 60 cycles, 13,200 volts, to operate at 1,800 r.p.m.

**Plans for City Lighting in St. Louis.**—Fifty thousand dollars has been appropriated for making the plans for the city lighting system authorized by the St. Louis voters recently. The project involves establishment of approximately 50,000 electric lamps and the abolishment of 23,000 gas lamps. It is planned to place lamps experimentally at various points to determine by actual use which gives the most satisfactory light. One lamp under investigation will, it is claimed, illuminate the sidewalk without shining into the houses alongside. A special refracting lens is placed on the sidewalk side of these lamps which limits the area of illumination, while on the other side the light is thrown far over the street.

**Indiana Company Shows New Plant to Business Men.**—More than two hundred prominent business men of Indianapolis visited the new plant of the Central Indiana Power Company, on the Wabash River, 6½ miles from Terre Haute, last week as guests of the Merchants' Heat & Light Company, under the personal direction of Charles O'B. Murphy, vice-president and general manager. This plant was described in the ELECTRICAL WORLD for March 31, page 770.

**Insull Companies Take Interest in Social Welfare Work.**—A public utility chapter of the Illinois Children's Home and Aid Society with a potential membership of 25,000 among the employees of the Insull properties in Illinois is the latest move of interest in public welfare among utility organizations. A board of governors, with John F. Gilchrist of the Commonwealth Edison Company as chairman, Britton I. Budd as vice-chairman, L. C. Tovay as secretary and F. H. Scheel as treasurer, has been formed. The dues and other funds collected will all be turned over to the parent society, and the incidental office and clerical expense will be borne by the public utility organizations whose employees make up the chapter.

**To Put the River Bann to Work.**—Plans for utilizing the waters of the River Bann, flowing into Lough Neagh, in County Antrim, Ireland, 30 miles from the city of Belfast, have reached the stage at which many influential people are interested in their accomplishment, says Consul Kent, Belfast, in a report to the Department of Commerce. The purpose of this scheme is to generate electricity sufficient to supply all of the industries of that section. A bill was introduced into the British Parliament early this year for the chartering of a company and conferring upon it the necessary powers to proceed with this work. It is said that the people of County Antrim have just begun to realize that the River Bann possesses one of the finest hydro-electric power schemes in the whole United Kingdom and that enough power could be produced to light the whole of the six counties of northern Ireland and supply every mill and factory with power.

## Associations and Societies

**Chicago Section, A. I. and S. E. E.**—On June 27 the Chicago Section of the Association of Iron and Steel Electrical Engineers will hold an outing aboard a lake steamer sailing from Chicago to Michigan City and return.

**Worcester A. I. E. E. Section Elects Officers.**—The following officers have been elected by the Worcester (Mass.) Section of the A. I. E. E.: Chairman, Lewis E. Pierce; vice-chairman, Henry O. Tilton; secretary and treasurer, Stuart H. Anson.

**San Francisco Engineers' Club.**—Five hundred members of the San Francisco Engineers' Club, the San Francisco Electrical Development League and the Electric Club of Oakland were the guests of the San Francisco-Oakland Terminal Railways on May 28, when they were taken for a ride around the bay on the Hayward, the first turbo-electric ferryboat ever constructed, which is driven by two 1,200-hp. General Electric marine-type motors.

**I. E. S. to Convene at Lake George, N. Y.**—The 1923 convention of the Illuminating Engineering Society is to be held Sept. 24 to 28 inclusive at Lake George, N. Y. The headquarters of the convention will be the Fort William Henry Hotel. A well-balanced program of commercial and technical papers is being prepared by the committee on papers, under the direction of J. L. Stair of Chicago; a good program of entertainment will be provided, and unusual spectacular lighting features are planned.

**Northwest Electric Light and Power Association.**—The annual convention of the Northwest Electric Light and Power Association (geographic division N. E. L. A.) will be held in Seattle, Wash., June 27-30. The commercial and technical sessions will be held at the Washington Hotel in Seattle during the first two days of the convention, and on Friday morning the delegates will leave for Victoria, B. C., via Canadian Pacific steamship. The annual golf tournament will be held in Victoria on Friday afternoon, and following a banquet in the evening at the Empress Hotel the executive session will be held. At this session special reports will be presented and the election of officers will take place.

### Coming Meetings of Electrical and Other Technical Societies

[A complete directory of electrical associations is published in the first issue of each volume. See Jan. 6 issue, page 78, for latest list.]

Southern Appalachian Water Power Conference—Asheville, N. C., June 25-27. J. A. Switzer, Knoxville, Tenn.

American Institute of Electrical Engineers—Annual convention, Swampscott, Mass., June 25-29; Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Atlantic City, June 25-29.

Iowa Section, N. E. L. A.—Mason City, June 26-29. M. A. Linn, Des Moines Electric Co., Des Moines.

Associated Manufacturers of Electrical Supplies—New London, Conn., June 26-29. Frederic Nicholas, 30 East 42d St., New York.

National Council Lighting Fixture Manufacturers—Buffalo, June 26-28. C. H. Hofrichter, 233 Gordon Square Bldg., Cleveland.

Northwest Electric Light and Power Association—Seattle, June 27-30. G. E. Quinan, 204 Electric Bldg., Seattle.

Ohio Electric Light Association—Cedar Point, July 10-13. D. L. Gaskill, Greenville.

New England Division, N. E. L. A.—Swampscott, Mass., Sept. 6-8. Miss O. A. Bursiel, 149 Tremont St., Boston.

Michigan Electric Light Association—Grand Rapids, Sept. 11-13. Herbert Silvester, Detroit Edison Co., Ann Arbor.

Rocky Mountain Division, N. E. L. A.—Glenwood Springs, Col., Sept. 17-19. O. A. Weller, 900 15th St., Denver.

Illuminating Engineering Society—Lake George, N. Y., Sept. 24-28. S. G. Hibben, 29 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Buffalo, Sept. 24-28. J. F. Kelly, 513 Empire Bldg., Pittsburgh.

American Electrochemical Society—Dayton, Ohio, Sept. 27-29. Colin G. Fink, Columbia University, New York.

# Recent Court Decisions

**Man Who Remains at Work in Dangerous Place After Seeing Companion Injured Cannot Recover Damages for Subsequent Hurt.** — In Straight vs. Western Light & Power Company, the Supreme Court of Colorado upheld the trial court in directing a verdict for the defendant. The evidence showed that Straight and another were working on a roof crossed by high-tension wires and that Straight's companion was slightly injured apparently by electricity leaking from these wires, which he did not touch. Subsequently the plaintiff was severely injured from the same cause. He testified that, although he had been originally warned not to go near the wires, on the day when he was injured the company's agent told him that they were "not leaking now" and it was safe to work under them. The court held that the injury to his companion constituted a warning that Straight, as a matter of law, was culpably negligent in disregarding. (214 Pac. 397.)*

**How Inadequate Income Injures Credit.**—In declaring confiscatory the rates prescribed by the Public Service Commission of West Virginia for the Bluefield Waterworks and Improvement Company (see issue of June 16, page 1429), the United States Supreme Court made these observations on the relation of income to credit and the injury caused by a rate of return too low to afford stability: "Investors take into account the result of past operations, especially in recent years, when determining the terms upon which they will invest in such an undertaking. Low, uncertain or irregular income makes for low prices for the securities of the utility and high rates of interest to be demanded by the investors. The fact that the company may not insist as a matter of constitutional right that past losses be made up by rates to be applied in the present and future tends to weaken credit, and the fact that the utility is protected against being compelled to serve for confiscatory rates tends to support it."

**"Present Fair Value" Not Synonymous with "Present Replacement Cost."**—In the case of the Georgia Railway & Power Company and the Atlanta Gas Light Company against the Public Service Commission of Georgia (see issue of June 16, page 1430), in which the gas rates set by the commission were attacked, there was a great difference between the valuation figures of the company and those of the commission's engineers, as well as a difference as to the rate of return which the proposed new rates would yield, the company asserting that it would be 3 per cent and the commission that it would be 6 per cent. The State Supreme Court dismissed the suit, partly on the ground that the return could not be determined until the lower rate was tried in practice. The majority opinion of the United States Supreme Court concurred in this view. (See also the Brush Electric Company case, issue of June 16, page 1435.) The court of last resort also approved the finding of the Georgia commission that "present fair value" is not synonymous with "present replacement cost," particularly under abnormal conditions. "The refusal of the commission and the lower court to hold that for rate-making purposes the physical properties of a utility must be valued at the replacement cost, less depreciation, was clearly correct," the majority opinion declared.

**Right of Commission to Institute Revaluation Proceedings Upheld.**—The right of the Alabama Public Service Commission to revalue the property of a public utility for rate-making purposes has been upheld in the Federal District Court in a case brought against the commission by the Mobile Gas Company. The court held, however, that the commission could not force the company to produce its books for a second examination. The decision has the effect of declaring constitutional the Brower bill passed by the last Legislature giving the utility board power to revalue a public utility when it deems fit. The opinion, reversing a previous dictum of the court, said that a contract between the state and the gas company did not result from the valuation of the company's property at its own expense.

**Indiana Commission Upheld in Permitting Competition in Indianapolis.**—An injunction against the action of the Indiana Public Service Commission in permitting the Terre Haute, Indianapolis & Eastern Traction Company to enter the competitive field in Indianapolis for supplying electric light and power has been refused by the Superior Court on the ground that there was no showing that the commission had acted beyond its jurisdiction, had acted with fraud, or that its order had violated any constitutional rights of the Indianapolis Light & Heat Company or the Merchants' Heat & Light Company. A salient point in the ruling was that "the public authorities are not prevented from granting a franchise to a subsequent and competing corporation merely because the effect of such subsequent franchise may be the creating of competition which will injure the business of the original corporation." The court said: "Even if there was no evidence of public necessity, yet if we are right, that no terms of any contract the plaintiffs hold have been violated, and if they are not being deprived of any property unlawfully, then, if the action of the commission was within its jurisdiction and no fraud was shown, the action of the commission is final."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

# Commission Rulings

**Considerations Governing Rural Extensions.**—Dismissing a petition from residents of North Gray who sought to compel the Cumberland County Power & Light Company to serve them, the Maine Public Utilities Commission declared that extensions of service should not be required in a section of a community so situated, by reason of its distance from the distribution line in sparsely settled territory or for any other reason, that service to it can be rendered only at additional or extraordinary cost, unless a guaranteed revenue approximating at least the cost of rendering said service can be had.

**Operation at a Loss.**—A public utility company cannot be compelled to operate at a loss where it is impossible to hold out the possibility of earning operating expenses, depreciation and a fair return upon its property serving the public. So holding, the Indiana Public Service Commission authorized the Winona Electric Light & Water Company to abandon heating service where the plant had been continuously operated at a loss, operating expenses could not be reduced, and where the company, if it was to continue to operate, must secure increased revenue. The likelihood of gaining additional consumers was very slight, and the heating rate was so high as to be practically prohibitive. The commission said that to increase the rate to a point that would permit the payment of operating expenses and a return would not be practicable as the present rate was so high that an attempt to increase it would probably result in a loss in customers and a decrease in revenue.

**Reasonableness of Desired Extension Must Be Determined.**—The public utility is not the only party to be affected by making expenditures in extensions, the Idaho Public Service Commission observed in a case concerning utility service in Cœur d'Alene. "The existing consumers," it continued, "must be considered in determining whether or not an extension should be made. Before an extension should be made there must be taken into consideration not only the necessity of the service but also the reasonableness of the demand. Even though there exists a necessity for the service the extension should not be made unless the demand is reasonable. Otherwise such extensions would result in increasing the rates upon the existing consumers. Extensions should not be made by a public utility where the immediate and prospective revenues to be received from such extensions are out of proportion to the cost of making the extensions. The expenditures for extensions must be guarded in order to protect the existing consumers against exorbitant rates."

# Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

## F. M. Feiker Joins Society for Electrical Development

F. M. Feiker, formerly vice-president of the McGraw-Hill Company, Inc., and more recently on leave of absence as special agent of the Department of Commerce at Washington will after his return from Washington, be associated with the staff of the Society for Electrical Development, New York City. As a result of the appointment of Mr.

©Underwood & Underwood
F. M. FEIKER

Feiker the various branches of the electrical industry served by the society will secure the benefit of his broad experience and background, for he will be available to act as a special counselor to engineers, manufacturers, central stations, jobbers, contractor-dealers and publishers. His special training and wide knowledge in the engineering publishing and public relations field of many industries, qualify him eminently for such consulting work. Mr. Feiker will retain a consulting relation to the McGraw-Hill Company, and he will continue in a similar capacity his relation to the problems of personnel and organization of the Department of Commerce at Washington.

**Alfred S. Nichols**, who has been with the Stone & Webster organization for thirteen years and for the past six years has been manager for it of the light, power, street-car and gas company at Paducah, Ky., has been appointed manager of a new company organized to carry on the electric light, power and street-railway business in Kingston, Jamaica, British West Indies. Montreal banking interests organized the company, and Stone & Webster, Inc., of Boston have been appointed general managers. Mr. Nichols is of English birth and has had a wide business experience in British mercantile work and, during the past twenty years, in the United States in newspaper work and in the operation of public utilities.

**Clive C. Bell** has resigned his position as city salesman for the Wisconsin Valley Electric Company, Wausau, Wis., to become sales manager for the Ironwood (Mich.) branch of the Lake Superior District Power Company.

**John C. Karcher**, who was associated with the Bureau of Standards, Washington, D. C., until last February, has entered the service of the Western Electric Company as research engineer at the Hawthorne plant, Chicago.

**Samuel B. Flagg** has become associated with the Sanford Riley Stoker Company of Worcester, Mass., as special representative at New York City. Mr. Flagg was engaged for several years in fuel studies with the United States Bureau of Mines, and for the past six years has been associated with the Electric Bond & Share Company as fuel expert.

**Frank B. Faris**, formerly attorney-examiner for the Public Service Commission of Indiana and recently associated with the law firm of Haynes & Mote, Indianapolis, has entered the general practice of law in that city under his own name, devoting himself particularly to rate, securities, valuation, tax and other matters affecting public utilities before regulatory boards, commissions and the courts.

**Dr. W. R. Whitney**, director of the research laboratory of the General Electric Company, was recently elected a member of the corporation of the Massachusetts Institute of Technology for a term of five years. He was graduated from the institute in 1890 and has for some time been a non-resident professor of theoretical chemistry there. Walter Humphreys of Brookline and Charles R. Maine, consulting engineer of Boston, were also elected. These three sueceed P. W. Litchfield, A. D. Little and E. S. Stevens.

**L. C. Bewsey**, superintendent of the Michigan United Railways, Kalamazoo, Mich., has severed his connection with the company to become general manager for the holdings in Cuba of the Electric Bond & Share Company of New York, with headquarters at Santa Clara. Previous to his association at Kalamazoo Mr. Bewsey spent four years in the Philippine Islands as superintendent of transport and motive powers for the Manila Electric Company and as electrical engineer in charge of estimates, designs and construction for the Pacific Commercial Company of Manila.

## A. H. Timmerman Electric Power Club's New President

Arthur Henry Timmerman, vice-president and chief engineer of the Wagner Electric Manufacturing Company of St. Louis, was elected president of the Electric Power Club at its meeting in Hot Springs, Va., last week. Mr. Timmerman has been associated with the Wagner company since 1899, when he left the School of Mines and Metallurgy of the University of Missouri, where he was professor of physics and electrical engineering, to enter the industrial field as an engineer. In 1908 he was advanced to the position of chief engineer, and in November, 1919, he was made vice-president and chief engineer, the office he occupies at the present time. Mr. Timmerman was born in New York

A. H. TIMMERMAN

City in 1871. He was graduated from the College of the City of New York in 1891 and later received the degrees of M.E. and M.M.E. from Cornell University. He spent one year as instructor in physics at Washington University, St. Louis, and for five years previous to his association with the Wagner company he was at the University of Missouri. Mr. Timmerman is a fellow of the American Institute of Electrical Engineers and a member of the National Electric Light Association and of the Society of Automotive Engineers.

**J. W. Denison**, formerly purchasing agent of the Southern Wisconsin Electric Company at Lake Geneva, Wis., has been made assistant treasurer of the Michigan Gas & Electric Company, with headquarters at Three Rivers, Mich.

**Horace H. Dodd**, manager of the Lawton & Duncan Electric Company, Lawton, Okla., has tendered his resignation and will be succeeded by J. S. Boyett. The Lawton & Duncan Electric Company is successor to the Comanche Light & Power Company, the Duncan Electric & Ice Company and the Temple Electric Company, and Mr. Dodd has been identified with these properties for the last fifteen years.

# Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

## Breaking Into the Electrical Industry

### Obstacles Encountered by the New Manufacturer a Brake on Progress and a Menace to the Industry

By a Small Manufacturer

THERE is a situation in the electrical industry which I believe should be discussed. Unless it is corrected, it will deprive the industry of the inventive genius and vision of many of our young men by making that part of the industry devoted to the manufacture and sale of wiring supplies an unattractive field to enter.

There is nothing that appeals more strongly to the interest and imagination of the best type of American youth than the mystery and constantly new developments and applications of electricity. As a result, our engineering schools are filled with students who are taking courses in electrical engineering, hoping that with their enthusiasm and vision, backed by their willingness to work hard, they may be able to attain success in their chosen profession. These young men in their home training and in their competitive athletics have developed a high sense of honor and square dealing, and never for an instant imagine that in their chosen electrical field they will meet with other than the square deal, with success the reward to the best man. With the present conditions in the industry they are bound to meet with disappointments which will destroy their faith and ideals.

#### An Opposing Barrier

In order to view the situation clearly, let us assume that some of these young men start to manufacture a line of wiring supplies, first having closely studied the uses to which the various devices are put, and also having studied their competitors' products, so that in their product they may incorporate as many improvements as possible both from an engineering and a quality standpoint. And let us assume that they have turned out a high-grade product that could be sold in fair competition.

They call on all the principal jobbers of electrical supplies and receive a rather cool reception and no orders. Many of the men interviewed remark on the superior quality and cleverness of the designs, but they all frankly state that under no circumstances would they handle any of the product. Some kindly soul then tells them that they are "up against a hopeless proposition," as all of the jobbers on whom they have called are "old line" jobbers, and in the wiring supply field these jobbers rarely handle anything but the products of a small group of large "old-line" manufacturers. And so our young friends will soon discover that it is exceedingly difficult to market their products through the leading jobbers.

#### Using the Patent Feature

It would seem at once that such a relationship between manufacturers and jobbers clearly is in restraint of trade, and it may be wondered how it comes to be permitted, but the answer is soon found. There is some slight detail of the product of this "old-line" group of manufacturers that is covered by a patent. The detail may be trivial or even a disadvantage as compared with some other construction, but it is patented and therein lies its value. If one of the manufacturers in this group has some patented feature with his product that can be made a talking point, although practically of no value, all of the manufacturers in the group embody this feature in their device, and by advertising and sales work endeavor to create the impression that this feature is essential to a device of the kind. The United States government, in granting a patent, grants the recipient of the patent a monopoly for seventeen years on that particular construction. It is therefore clear why these manufacturers attach such importance to some apparently unimportant patented feature.

With the principal outlets for their products shut off from them, our young friends now are forced to seek other channels through which to move their products, and they find that there are a number of smaller dealers and small jobbers who are selling a great deal of material, but at very low prices. While a manufacturer must quote about 10 per cent below the prices of the "old-line" manufacturer in order to obtain the business, still, as the overhead expense of a small manufacturer is very much less than that of a large company, this difference in selling price is under normal conditions not a serious handicap. Therefore, as the young manufacturers have a good product and have made strong connections with the smaller jobbers, they begin to make some headway, but not for long, as the "old-line" manufacturers and jobbers are watching them closely, and as soon as they see that any manufacturer of wiring supplies is getting a foothold they open a barrage of cut prices which they expect will forever quiet the ambitions of any competing manufacturers. The price cutting is confined solely to the products made by the manufacturers under attack, while on other wiring lines prices are kept high to cover losses from cut prices.

#### Obstructive Distribution

If some one manufacturer was to make such sweeping cuts in selling prices, it would be an indication of gross incompetence, but when a group of manufacturers send out at the same time the identical cut prices, confined to certain articles, it would seem clear that they are acting on a definite plan to eliminate competition. They feel that no manufacturer can exist whose products are confined to those on which they have cut the prices, and the

cut is no doubt made to accomplish that purpose.

To make these cut prices effective the "old-line" manufacturers have to count on the old-line jobbers handing the cut on to the trade, but a jobber realizes that cutting the selling prices in half may have a serious effect on his profits and so does not always want to help out in the plans. It, therefore, has become necessary for the manufacturers to have their own selling force right out on the firing line so that the cut prices can be handed directly to the wiring contractor, and to accomplish this they buy up electrical supply houses in different parts of the country so that the field shall be fully covered.

If our young friends had entered the radio manufacturing field or some other field than wiring supplies, their situation would have been quite different. Here they would have found the same "old-line" jobbers very keen to consider any proposition of merit, as they would not be acting under the restraint that governs them in the wiring supply field. Entirely new manufacturers of radio and other electrical parts have built up large businesses through these same jobbers, which indicates the possibilities of the industry when all restraint is removed from it.

### ARE SMALL MANUFACTURERS NEEDED?

It may be argued that the industry does not need the small manufacturer and that there is no room for him, because the large "old-line" manufacturers can supply all of the needs of the industry; but is this a fact?

Practically all of the improvements in wiring supplies have come from some upstart manufacturer and then have been copied by the "old-line" manufacturers, who by their grip on the industry have secured the profits that should have gone to the men responsible for them and which would have gone to them had it not been for the methods above described.

Another plan frequently used by such manufacturers in their efforts to kill competition is to threaten the smaller men with a suit for infringement of some patent. There may be no real basis for a suit—absolutely no infringement—but attempts are made to bluff some manufacturer into giving up a line that he manufactures rather than face the expense of litigation; for the large company knows that it can frequently wreck a small company by litigation more easily than by any other method, owing to the expense of defending the suit. In other cases dealers are warned by salesmen against buying the product of the new manufacturer and are told they may be liable to a suit for infringement if they do so. This has been tried in a number of cities at the same time, showing it to be part of a definite plan.

Such methods cannot stand the light of publicity, and the quicker they and others like them are exposed the sooner will the electrical industry become what it rightly deserves to be—that is, one offering to the bright American youth wonderful opportunities, with equal right to all and with the reward to the one justly earning success by his contributions to the industry.

# One Profit for the Jobber

## A Policy of Wholesale Business Only Is that Toward Which the Jobbing Industry Must Work as Its Service Grows More Intensive

BY E. C. WEHLE

President Southern New York Electrical Supply Corporation, Binghamton, N. Y.

THE jobber of the future will have to be contented with one profit. As every man who is studying the trend of the electrical industry knows, the jobber's business is becoming steadily more localized. Contractors are buying more habitually from their nearest sources of supply, and the warehouse and service function of the jobber is becoming of steadily growing importance. The trend seems to be away from the day when the jobber traveled and sold on a wide territory in active competition with a large number of other jobbers and toward a more intensive service in a smaller district which can be served quickly, easily and economically from the warehouse.

Moreover, the customers of the jobber are becoming more and more opposed to competition from those from whom they buy. Put yourself in their place. Would you care to buy your material from a manufacturer who competed with you every workday in the week? Of course, this does not affect the contractor 50 miles from your place of business, but at the same time it is a good argument as it affects the electrical jobber who sells at wholesale only.

I absolutely know that the jobber who is now in the contracting and retail business will increase his wholesale end if he will stop trying to make double profit. Perhaps his earnings will not be so large the first few years, but they will ultimately gain by such a policy. I have heard of jobbers who have a contracting department threatening to put out of business a contractor who did not buy from them. I have seen jobbers establishing retail stores in small towns and cities trying to put the contractors out of business because of some grievance. But such a policy loses friends and customers and kills any business.

I believe that a jobbing house doing a "wholesale-only" business can render better service to its customers because it can devote all its time and energy to that end. The game today for the electrical jobber is to keep down his overhead and not build or rent a building for display purposes; rather, to consider location, yearly rental or investment in building, method of receiving and shipping of material, to give good service and not be too lenient with credits.

I have watched the jobbing business develop for many years. My first experience was at the age of fourteen years. I made a deal with a local locksmith who had a retail store on one of the main streets in Rochester, N. Y. We put in a fifty-dollar stock of electric bells, batteries, etc. I borrowed my $25 from my father. Nichols took the orders for repairing and installing doorbells and I did the work after school hours. We then split the profit at the end of the week. I made $180 the first year. I then decided I would make the electrical business my life-work. After I finished school in Rochester I got enough money to go to an electrical school in Washington.

When I returned from Washington I obtained a position with a Buffalo jobber as road salesman, and for the past sixteen years I have been in the jobbing end of the electrical business and have learned to love my work.

In the twelve years I was on the road I had an increase of business every year with the exception of three. I have always tried to increase my business over the previous year.

I am now president of this company. We have a location in the wholesale section, just off the main street in Binghamton. We pay less rent than any other jobber in the section. Goods received from manufacturers are put in a chute on the front of building and sent on the way to our stockroom. Like most jobbers, we have all the labor-saving devices that are necessary to make prompt delivery at a minimum cost.

Our business is growing very rapidly and I consider our success due to our policy of doing business. We sell at wholesale only, and the interest of our customers is therefore our most important consideration. We are not in competition with them at any point and are free to put our whole mind to serving them and developing the greatest possible amount of business for the territory we cover.

## Bearing of Linseed-Oil Decision on Open-Price Plan

BY FRANZ NEILSON
Counsel Association of Electragists International

ON THE fourth of June the United States Supreme Court handed down a decision declaring illegal the operations of the linseed-oil producers in conjunction with the Armstrong Bureau of Related Industries of Chicago. The question has been asked whether it is true that this decision means that all open-price associations must discontinue.

The answer is that it means no such thing. A number of people are as much mistaken in this conclusion concerning the effect of that decision as they were in others in the past, notably the Hardwood case and the Gypsum case.

The linseed-oil plan is no more representative of the things that can be legally done in open-price associations than the Hardwood and the Gypsum plans were.

The linseed-oil arrangement was not an open-price bureau at all. Stripping its written plan of the excess verbiage, there remains an agreement (a) to file price lists and (*b*) not to cut such filed prices without at once notifying the bureau. Add to this the intense activity of the bureau in pursuing cases where a cut in price was made—instanced by getting members "on the carpet" when such cuts were made—and we have a combination about as unlawful as in the Hardwood case. Filing a price list and agreeing to telegraph if that price should be cut amounts to fixing future prices.

We cannot say that this decision has any bearing on the plain, legally operated open-price exchange—except the psychological one of scaring people who do not understand.

It is plain that the linseed-oil scheme did not fall within the lines of the thumbnail chart previously issued regarding safe conduct under an open-price plan. That chart is as follows:

The members may exchange facts, including past prices and other statistics, and meet in pursuance thereof; but there must not be any agreement, express or implied, or concert of action respecting the things prohibited, which are chiefly prices to be charged, apportionment of territory, allocation of customers, limitation of production, discipline of competitors, etc.

Each member by himself and uninfluenced by the others must arrive at his own conclusions from the facts he has received and decide for himself what he will do, and this without communicating his decision by word or sign to the others.

Argument from business men, as distinguished from lawyers, in favor of statistical activities by trade associations is found in the report of the committee on trade associations of the United States Chamber of Commerce, appearing in the chamber's "Referendum No. 41," published Feb. 26 last.

Excerpts therefrom are:

"That the courts and investigations made by the Secretary of Commerce have disclosed a small minority of associations which may have misused statistics in carrying out a scheme to restrain trade we believe in no way invalidates or discredits legitimate collection and distribution of trade statistics by associations. On the contrary, your committee is confident that proper statistical activities on the part of trade associations not only do not run in contravention of laws respecting restraints of trade, but actively encourage and develop trade. . . .

"Summarizing the preceding discussion, the committee believes that trustworthy information concerning capacity, production, stocks, sales and prices is essential to the effective operation of industry and trade under competitive conditions. The voluntary reporting of such information to trade associations and the subsequent publication or dissemination of such information in a manner which makes it available not only to contributors but also to consumers and to the public generally is beneficial alike to the field of business and the public and does not constitute a restraint of trade."

## Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

RENEWED activity in trade was reported last week by electrical supply jobbers. Manufacturers are busy in electrical lines and transportation conditions are much improved. Production by central stations is gaining by leaps and bounds. Stocks in distributors' hands are now well rounded, the only shortage reported being in some of the larger sizes of rigid conduit.

Prices weakened slightly last week in rubber-covered and weatherproof wire, with some readjustments in flexible armored conductor. Seasonable weather long delayed is moving fans, but the outlook is not attractive in the coastal sections for a record business in fans this year. Washing machines are selling well, but the demand has slackened somewhat within the past four weeks.

Electrical presents are increasing in popularity for the June bride, and there is a good demand for automobile accessories of electrical character. Motor sales are in excellent volume, but competition is very sharp. Barring weakness in cotton-textile production and excessive labor costs in the building industry, with continued uncertainty as to the outcome of wage demands in the telephone field, Eastern business is in excellent condition. The demand for paper for use in cable manufacture is unusually heavy.

### Permanent Palace for Electrical Industry at Leipsic Fair

FOR some centuries an annual fair has been held in Leipsic, Germany, to which sellers have brought their wares and buyers have come to view them and to purchase. With the development of regular commercial channels and relations, it became usual to bring only samples to this fair, and orders were taken for future deliveries.

Electrical manufacturers have exhibited their apparatus and materials at this fair wherever they could find place, with all the accompanying inconveniences. Press dispatches now tell of the completion of a "Haus der Elektrotechnik," or a home of electrical industries, in which each exhibitor can have the same space year after year,

with permanent wiring, and merely change his exhibits if he so desires.

The exhibitors are divided into ten groups: (1) Large companies with several lines of manufacture; (2) motors, generators and transformers, with starters, regulators, etc.; (3) measuring instruments and meters; (4) communication field and devices using small currents; (5) switchboard equipment and wiring supplies; (6) porcelain products; (7) cables, wires and conduit; (8) raw materials; (9) heating, cooking and medical devices; (10) the illumination field. The building is provided with an auditorium for conventions or for special exhibitions. The electrical interests are said to be the first group of industries to provide a separate building for its exhibits at the fair.

## San Francisco Business Reported on Increase

WIRING crews are very busy, but estimators and outside solicitors for construction work report slower conditions. Store business is better, but the larger socket appliances, such as washers, are in their usual seasonal slump. Pole-line hardware prices have increased about 5 per cent, but other lines remain firm. Steamer rates to the Coast will advance July 30 and so, if for no other reason, further advances in all bulky lines may be expected. The steamer rate increase may be as high as 40 to 50 per cent. Probably half of present shipments are reaching the coast via steamer. Range sales are holding up well in sight of the 1,500 total for 1923 estimated by one of the power companies. Pole line material of all kinds is moving very briskly. Street-lighting material is expected to move very well, $2,000,000 for California being an expert estimate of sales within the next year.

## Chicago Jobbers Report Another Quiet Week

ELECTRICAL jobbers report another quiet week of trade. While a greater amount of contracts for various commodities and work of divers kinds have been figured on this week, the actual orders received have not been up to last week's mark. Pole-line hardware demand, however, has been very good. High-tension equipment demands still remain steady owing to central-station buying, which has been quite active. Certain types of motors of one manufacturer have increased 10 per cent. This increase covers types not increased previously. Conduit stocks have been replenished to a certain extent and firm prices are again being quoted by some manufacturers.

Transformer demand has been the same as previously, with no exceptional demands for this class of material at this time. Prices are firm and deliveries are not being made inside of six to eight weeks. Schedule-material prices are firm and stocks normal. Building permits for this week amount to $5,712,000, as against $5,019,000 last year. Labor unions are still arbitrating wage increases and the closed-shop conditions, which have had a tendency to retard building in this section.

## Delinquent Electrical Accounts in May Showed Improvement

AN IMPROVEMENT in the number of delinquents in electrical accounts for May, 1923, over April, 1923, is shown by the report of the National Electric Credit Association. All territories except New York show a lowered average value for this period. In the Chicago territory the total amount for April, 1923, was $111,130, while in May, 1923, it was lowered to $95,984. However, comparing May with May, 1922, the average amounts were $128 and $113 respectively.

DELINQUENT ACCOUNTS IN MAY

| Branch and Month | Number of Delinquent Accounts Reported | Total Amount | Average Amount |
|---|---|---|---|
| Central Division: | | | |
| April, 1922.... | 799 | $87,991.88 | $110.13 |
| April, 1923.... | 794 | 111,130.28 | 139.96 |
| May, 1922.... | 746 | 84,048.53 | 112.66 |
| May, 1923.... | 749 | 95,984.35 | 128.15 |
| New York: | | | |
| April, 1922.... | 460 | 56,616.00 | 123.00 |
| April, 1923.... | 422 | 63,771.00 | 151.00 |
| May, 1922.... | 440 | 58,401.00 | 133.00 |
| May, 1923.... | 437 | 68,228.00 | 156.00 |
| Philadelphia: | | | |
| April, 1922.... | 232 | 34,454.70 | 148.51 |
| April, 1923.... | 241 | 35,099.19 | 145.80 |
| May, 1922.... | 236 | 22,175.99 | 93.97 |
| May, 1923.... | 225 | 26,399.32 | 117.33 |
| New England: | | | |
| April, 1922.... | 68 | 7,128.00 | 104.82 |
| April, 1923.... | 44 | 7,979.04 | 181.34 |
| May, 1922.... | 108 | 7,908.93 | 63.97 |
| May, 1923.... | 29 | 3,464.08 | 119.45 |
| Pacific Coast: | | | |
| April, 1922.... | 25 | 3,594.67 | 143.50 |
| April, 1923.... | 39 | 8,444.75 | 216.53 |
| May, 1922.... | 24 | 2,133.82 | 88.99 |
| May, 1923.... | 20 | 2,910.69 | 145.70 |

The May, 1923, New York account, as compared with April, 1923, shows an increased average amount of $5. The number of delinquent accounts was 437 and 422 for May and April, 1923. The Philadelphia section for April and May, 1923, had lowered its accounts from $146 to $117, also reducing the number of accounts by sixteen.

The accounts in the New England territory for May, 1923, totaled $3,464, as against $7,979 for April, 1923. The total number of accounts for the same periods was twenty-nine and forty-four. On the Pacific Coast the accounts for May and April of this year were $146 and $217. The total number of accounts was lowered by nineteen.

A complete list of the accounts is reproduced above.

## General Buying Trend Is Still Cautious

MOST of the tests by which business trends are measured show a diminution of buying in primary channels, but a gain in retail distribution, according to Dun's review of trade. These are seasonal phases and do not mark any unusual or unexpected change in the general situation. Close observers of conditions had not anticipated that the noteworthy industrial expansion of the first quarter of this year would continue indefinitely, or that the rise of prices would go on unchecked, and the recent slowing-down process, with reaction in prices, has not been surprising.

The chief interest now centers on the probable course of events after the passing of the summer, and there is a disposition in many quarters to await a clearer insight into the future. This attitude is reflected by the increased conservatism in the placing of advance orders, as well as by the policy of avoiding burdensome accumulations of merchandise. While goods previously contracted for are being taken readily in most cases, isolated instances of cancellations still appear.

## The Metal Market

THE metal markets continue comparatively inactive, though sales of copper have improved. Consumers are not buying for forward delivery to the extent they were a few months ago, as their bookings have declined somewhat owing to the fall in metal prices. Improved export demand for copper has continued and prices are up.

Most producers feel the price should be fairly stable at between 15 and 16 cents. Lead has been remarkably quiet, and the windup of the Pittman act purchases of silver will have a further effe t fn lessening production. In Chicago n ost sales have been at 7 cents. Zinc is quiet with less buying by galvanizers due to the price. Consumers are buying tin cautiously with forward deliveries sold ¼ cent less than spot.

NEW YORK METAL MARKET PRICES

| | June 14, 1923 Cents per Pound | June 21, 1923 Cents per Pound |
|---|---|---|
| Copper, Electrolytic | 15.00 | 15.25 |
| Lead, Am.S.& R.price | 7.25 | 7.25 |
| Antimony | 7.75 | 7.50 |
| Nickel, ingot | 27.00 to 32.00 | 27.00 to 32.00 |
| Zinc, spot | 6.37 | 6.37 |
| Tin, Straits | 41.90 | 41.90 |
| Aluminum, 98 to 99 per cent | 26.00 | 26.00 |

## Comparative Prices of Station Supplies

| | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|
| Soft steel bars, per lb. | $0.34 | $0.034 | $0.0252 |
| Cold finished shafting, per lb. | 0.042 | 0.042 | 0.0328 |
| Brass rods, per lb. | 0.1850 | 0.1913 | 0.1533 |
| Solder (half and half), per lb. | 0.2862 | 0.2812 | 0.22 |
| Cotton waste, per lb. | 0.1231 | 0.1231 | 0.104 |
| Washers, cast iron (⅛-in.), per 100 lb. | 4.66 | 4.66 | 4.00 |
| Emery, disks, cloth, No. 1, 6-in. diameter, per 100 | 3.08 | 2.96 | 3.11 |
| Machine oil, per gal. | 0.349 | 0.349 | 0.383 |
| Belting, leather, medium, off list | 42½% | 42½% | 46½% |
| Machine bolts, up to 1-in. x 30-in., off list | 44½% | 44½% | 62½% |

# Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

## Rescind Order to Close Lamp Works at Warren, Ohio

Officials of the National Lamp Works of the General Electric Company, Cleveland, at a meeting in New York, have rescinded the decision, previously announced, to close the works at Warren, Ohio.

According to A. M. Sweeney, manager at the plant, they will be continued in operation for an indefinite period, and the plan to concentrate production at the Cleveland works will temporarily be abandoned. The Trumbull (Ohio) plant of the company has been idle for for more than three months and has been placed on the market at a figure of $250,000.

## Nilco Lamp Works Acquires Whitelite Electric

The Nilco Lamp Works, Inc., Emporium, Pa., purchased the equipment, raw material and finished lamps of the Whitelite Electric Company, New York, on May 31. The purchase also included the transfer of the General Electric Company licenses of the Whitelite Electric Company and the New Jersey Tungsten Lamp Company to the Nilco Lamp Works, and they will be applied to increase the licensed quota of the "Nilco" lamps.

The Nilco company is moving its Type C works from Emporium and combining it with its Type B works at St. Mary's, Pa., where the general offices and warehouse will also be located eventually. This concentration of the company's operations will simplify production and facilitate shipments.

## Pelton Water Wheel Orders

The Pacific Power & Light Company has awarded a contract to the Pelton Water Wheel Company, San Francisco, for reconstructing the No. 4 turbine in its Walla Walla River plant, near Milton, Ore.. The work will include the installation of Pelton rubber-seal rings and a modern high-efficiency runner. The Pelton company recently reconstructed the No. 2 turbine in this plant, and the improvement obtained encouraged the Pacific Power & Light Company to have the same work done on the No. 4 unit.

The Montana Power Company has awarded a contract to the Pelton Water Wheel Company for furnishing two 7,500-hp. single-runner, single-nozzle impulse turbines for the first unit of its Mystic Lake (Mont.) development. These turbines will operate under an average effective head of 1,050 ft. and will embody various distinctive Pelton features such as auxiliary relief nozzles and direct-motion governors. The contract includes two hydraulic cylinder-operated gate valves at the power house and a butterfly valve at the head of the penstock. The latter will be equipped for electric motor operation and hand operation and for direct and remote control.

## Sturtevant Making Inquiries for Equipping Wisconsin Plant

The B. F. Sturtevant Company, Hyde Park, Boston, is putting out inquiries for a large list of new equipment for the manufacture of blowers and ventilating systems which will be needed for the retooling of the works of the former Wisconsin Engine Company at Corliss, Wis., recently acquired. The plant was idle six years, during which time the Corliss-engine production machinery was removed while use of the buildings was made by the government as a salvage warehouse. Harry W. Page, Boston, has been appointed works manager at Corliss.

## High Labor Costs Force Allis-Chalmers to Refuse Orders

Otto H. Falk, president of the Allis-Chalmers Manufacturing Company, has recently returned on the Holland-America liner Rotterdam after a four months' trip abroad.

"Allis-Chalmers is operating at about 75 per cent of capacity," he said, "but this is due to labor conditions, not to lack of business. We are turning down orders as we don't intend to increase labor costs because that would cause the price of our product to rise all over the country. Consequently, we are only producing our maximum with the labor we have at hand.

"Nearly all of the European countries are hard pressed for raw material. This is particularly true in Switzerland. Italy has the same lack of raw material. A number of large machinery plants in Europe have been recently closed because of this, and conditions in our line will not improve until the Rhur situation is settled.

"I talked with Dr. Cuno of Germany, and he wants to make every effort to clean up the situation. Dr. Cuno was much impressed with Secretary Hughes' proposal of an international loan to Germany by America and Great Britain. He wanted to arrange this loan and pay cash for a portion of Germany's obligations, and then have a conference of international business men, with Germany sitting in the conference, to decide how much more Germany could pay."

## Copper Export Association Sells Its Quota of 400,000,000 Lb.

The Copper Export Association, which was organized in 1921 to handle exports of copper metal for producers of the United States, has sold all of the 400,000,000 lb. of metal marked for export at that time. The association, it is said, will continue to handle the export business for the larger producers, despite the liquidation of the amount mentioned.

The association was organized at a time when the trade in metal for overseas and domestic account was at a low ebb. The larger companies continued production despite the falling off in business, and as a result stocks in large quantities began to accumulate in this country. Foreign business was not taking its usual amount of copper, and domestic buyers were not interested because of the general falling off in business. To lift a heavy load from the market, producers formed the association.

## Copper and Brass Research Body Adds Eight Members

The Copper and Brass Research Association has just added to its membership the Engels Copper Mining Company, Gransby Consolidated Mining, Smelting & Power Company, Dallas Brass & Copper Company, Merchants & Evans Company, T. E. Conklin Brass & Copper Company, J. M. & L. A. Osborn Company and Richards & Company, Ltd., the present membership of the association being composed of twenty-six copper-mining companies and fifteen copper and brass fabricating and distributing companies.

Information has just been received by the American association of the formation in England of a similar organization, the Copper and Brass Extended Uses Council, which will inform the public regarding the advantages of copper and brass for various purposes for which at present other metals or materials are being used.

## General Electric May and April Bookings Were $63,000,000

The General Electric Company during the months of April and May booked new business totaling approximately $63,000,000, or a monthly average of about $31,500,000. In the first quarter bookings were announced as $80,010,045, or a monthly average of $26,670,015. The total for the three months compared with $51,335,300 in the first quarter of 1922. This would bring the total new business taken on in the first five months of this year up to approximately $143,000,000. While indications point to bookings at an annual rate considerably in excess of $300,000,000, it is considered that if new business for this year totals between $300,000,000 and $320,000,000, the year will be a satisfactory one.

General Electric's business so far

while diversified, is particularly concerned with heavy apparatus, with some reduction in the lines of smaller apparatus. In some lines departments are running at capacity production with business booked well in advance. The company's plants as a whole are not at present operating at capacity.

Billings of General Electric to May 1 averaged approximately $20,000,000 a month, gradually augmented because of the shipments of heavy apparatus booked over a year ago. Billings for the year may exceed $270,000,000. The current year was entered with unfilled orders of approximately $76,000,000, and with the addition of orders taken since Jan. 1, 1923, the company has had approximately $219,000,000 of business to work on.

## Rubber Independents Unite to Promote American Production

Of particular interest to electrical manufacturers is the recent formation of an independent organization known as the American Rubber Manufacturers, Inc., made up of prominent rubber manufacturers who recently withdrew from the Rubber Association of America.

These independents have been holding conferences in New York City during the last few weeks to further the growing of rubber in possessions of the United States where the climate is favorable.

It is asserted that this movement did not receive the support of the older organization. The officers of the new organization are: T. R. Palmer of the Continental Rubber Company, president; C. E. Murray of the Murray Rubber Company, treasurer, and O. M. Mason of the Mason Tire & Rubber Company, secretary pro tem.

The new organization aims to obtain assurance of a continuous supply of crude rubber, at a reasonable price, which it is stated cannot be obtained now as a result of the present British domination of the crude-rubber supply of the world. It is declared there should be a free movement of rubber unhampered by legislation which creates an artificial price for the product.

## Majestic Electric Development Company Sold

The purchase of the plant and equipment of the Majestic Electric Development Company, San Francisco, by the Majestic Appliance Company, Inc., has recently been announced. The new company will continue the manufacture of "Majestic" heaters and appliances at the San Francisco factory.

The personnel of the new company is: A. T. Burt, president; T. M. Simpson, vice-president and general manager; H. H. Daley, sales manager. According to the announcement, the entire Majestic line of air heaters, pancake and waffle irons has been redesigned and added to.

## Western Electric Company Moves Into New Philadelphia Home

On June 18 the Western Electric Company completed its move from the familiar location at Eleventh and York Streets, Philadelphia, to its new home at 910 Cherry Street. This new five-story building provides floor space of about 50,000 ft., an increase in office and warehouse capacity which has been sorely needed by the organization.

Some of the interesting features of the building, as pointed out by Manager Van Valkenburgh, are special provisions for giving service to customers. A pneumatic tube has been provided to expedite the transfer of orders from office to warehouse; conveyors have been installed for transporting merchandise with the greatest facility from the upper floors to the shipping floor, and broken package stocks are carried on the first floor, easily accessible for delivery over the wholesale counter or to the shipping platform.

Following the best modern practice, the building has been designed to obtain a maximum of light and air. In the section devoted to offices there is light and air on four sides.

## Westinghouse Offers Common Stock to Employees

The Westinghouse Electric & Manufacturing Company announces a plan whereby all employees may participate in the purchase of a new issue of 20,000 shares of common stock to be paid for on the deferred plan at $53 a share (par value $50). Each employee may subscribe for one to twenty shares of stock and pay for it in ten consecutive monthly installments.

No interest will be charged on the deferred subscription payments. When the final payment on each stock subscription becomes due, dividends at the rate declared and paid on the company's common stock after Aug. 1, 1923, when the plan goes into effect, will be credited to the account of each subscriber.

This plan will in no way interfere with the insurance saving fund now in force. In the latter plan the employee, by depositing 2 per cent of his salary in a 4½ per cent interest-bearing savings fund, obtains additional insurance up to $1,500 over the $500 given by the company after six months' service.

Subscription rights are for the benefit of the individual employed and are not transferable.

Commenting on the stock issue, E. M. Herr, president of the company, said: "This opportunity for the purchase of stock by employees is in consideration of the frequently expressed wish of our employees that they be given an opportunity to purchase common stock of this company on a favorable basis.

"We are explaining to the employees that common stock of the company, like all common stock, is necessarily subject in its value to the fluctuating conditions of business. The company is very glad to have its employees become stockholders, but it is clearly understood that their participation in the ownership of the stock is a wholly voluntary act on their part."

## Electric Furnace Maker of Ohio Sells Plant

The plant of the Electric Furnace Company, Salem, Ohio, manufacturer of electric heating and melting furnaces, has been purchased by R. F. Benziger and F. A. Hoyles, Alliance, Ohio, and F. T. Cope, Salem, Ohio. The business will be under the management of Mr. Cope, who had long been connected with the old company. Mr. Benziger will have charge of the sales department.

**The Molded Products Company,** Hartford, Conn., which was recently incorporated with capital stock of $50,000, will manufacture molded and composition products for electrical manufacture. It will not be in a position to start active business for at least six months. The company's address is First National Bank Building, Hartford.

**The Shaw Electric Crane Company,** Muskegon, Mich., has commenced the erection of a two-story addition, 60 ft. x 100 ft., estimated to cost $60,000, including equipment.

**The Lee Duncan Electric & Manufacturing Company,** 4441 Manchester Avenue, St. Louis, recently organized, is perfecting plans for the establishment of a local plant for the manufacture of electric motors and fans. Lee J. Duncan is president.

**The Esterline-Angus Company,** Indianapolis, manufacturer of graphic meters for power-testing service, etc., has purchased the plant at Speedway City, near Indianapolis, formerly occupied by the Highway Tractor Company, comprising a two-acre tract of land, improved with a building, 100 ft. x 200 ft. Extensions and improvements will be made, and the present works at 227 East South Street will be removed to this location. Additional machinery will be installed for larger production. New buildings will be erected on the site in the near future. J. W. Esterline is president.

**The Spaulding Electric Company,** Detroit, has completed plans and will soon commence the erection of a new one-story plant on Michigan Avenue for electrical repair work and parts manufacture. It will cost approximately $25,000. James G. Spaulding, 1344 Michigan Avenue, is president.

**The Hoosier Engineering Company,** specialist in power plants, announces its removal to its new building at 325 South New Jersey Street, Indianapolis.

**The Blaw-Knox Company,** Pittsburgh, has obtained exclusive license to manufacture and sell Blair water-cool parts, reversing valves and removable slag pockets.

## Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Krakow, Poland (No. 6,811), for lighting sets for farms.

An agency is desired in Colim, Mexico (No. 6,839), for electrical machinery.

An agency is desired in Newcastle, Australia (No. 6,862), for radio equipment and appliances.

CATALOGS OF ELECTRICAL MACHINERY DESIRED IN FEDERATED MALAY STATES.—Lewis V. Fox, executive electrical engineer, Government Electricity Board, Kuala Lumpur, Federated Malay States, would like to receive catalogs and price lists of electrical machinery and accessories, hydro-electric generating machinery and high-tension aerial distribution material being of especial interest.

ELECTRICITY SUPPLY COMMISSION IN SOUTH AFRICA. — The Electricity Supply Commission provided for under the electricity act passed by the Parliament of last year, according to *Commerce Reports*, will soon hold its first meeting. It will appoint its own officials, raise its own revenue and generally act as a separate corporate body. As one of the purposes of the act is to keep the supply of electricity in bulk separate from the railways, the commission will take over the large power station in course of construction at Colenso, which will supply energy to the Maritzburg-Ladysmith Railroad when electrified. The commission will construct power stations at Durban and Witbank and will provide power near the Sabie gold fields in the Transvaal.

FUNDS PROVIDED FOR HYDRO-ELECTRIC WORK IN SOUTHERN ITALY.—A loan of 65,000,000 lire (a lira is $0.048 at present rate of exchange), according to *Commerce Reports*, has been arranged through the Ministers of Finance and Public Works to promote the Sila hydro-electric development in Apulia and Calabria, together with similar enterprises in southern Italy. The three companies on whose behalf the loan is effected are the Societa Forze Idrauliche della Sila, the Societa Meridionale di Elettricita and the Societa Generale Elettrica della Sicilia.

## New Apparatus and Publications

FUEL OIL-BURNING EQUIPMENT.—"A Complete Treatise on the Subject of Oil Burning" is the title of a new catalog issued by the Combustion Engineering Corporation, Broad Street, New York City, in which it describes and illustrates the "Quinn" fuel-oil-burning equipment. It also contains a complete test of the oil burners conducted in a large oil refinery.

TELEPHONE HEAD SET.—C. Brandes, Inc., 237 Lafayette Street, New York, Inc., has developed the "Brandes" clutch for adjusting the receivers for telephone head sets.

COMPOUND KETTLE.—A new double-jacketed compound kettle has been brought out by the P. Wall Manufacturing Company, Pittsburgh, for use with its "Dreadnaught" furnaces for melting joint-filling compounds.

LIGHTING DEVICE.—The Reflector & Illuminating Company, 565 West Washington Street, Chicago, has placed on the market a new lighting device, "Flood-O-Lite, Jr." form C, which is particularly adapted for the spot lighting of individual parts of a window.

ELECTRIC FURNACE.—Bulletin No. 3 issued by the Ajax Electrothermic Corporation, Trenton, N. J., describes the new Ajax-Northrup 35-kva. converter and the various standard high-frequency furnaces which may be operated from it.

GROUND CAP.—The Line Material Company, South Milwaukee, Wis., has developed a new type of ground cap.

VENTILATOR.—The Emerson Electric Manufacturing Company, 2012 Washington Avenue, St. Louis, has brought out a small "Junior" ventilator, designed for small apartment kitchens, etc.

ELECTRIC THERAPEUTIC BAKERS. —A line of therapeutical bakers for use by hospitals, general medical practitioners and specialists for treating sprains, etc., is manufactured by Walter S. Edmands, 25 Pearl Street, Boston.

SIGN RECEPTACLE.—A new sign receptacle, "Skeedoodle," designed especially for use in transparent window signs and advertising displays, has been developed by the Phelps Electric Company, 227 West Randolph Street, Chicago.

HEATING SYSTEM. — The Winslow Boiler & Engineering Company, Chicago, has brought out an electrically controlled oil-burning heating system, "Kleen-Heet," for heating residences.

VACUUM CLEANER.—The Joseph A. McAnerney Company, 62 West Forty-fifth Street, New York City, is marketing the "Mac" electric vacuum cleaner.

SWITCH BOXES.—The Roach-Appleton Manufacturing Company, 2446 North Crawford Avenue, Chicago, is manufacturing the "Raco" line of switch boxes.

ELECTRIC LAUNDRY STOVE. — The George D. Roper Corporation, Rockford, Ill., has brought out an electric laundry stove, which can be obtained in one, two and three-burner sizes.

POLARIZED LIGHT APPARATUS. — Adam Hilger, Ltd., 75a Camden Road, London, N. W. 1, has issued a booklet describing the polarized light apparatus manufactured by the firm as devised and used by Prof. E. G. Coker, F. R. S., for determining the distribution of stress in structural and machine members.

INSULATORS.—The Jeffrey-Dewitt Insulator Company, Kenova, W. Va., is distributing a new catalog covering its high-tension insulators. Bulletin No. 5 issued by the company gives the electrical mechanical characteristics of the flange-type insulators for switching equipment, bus supports, etc.

## New Incorporations

THE PLATEAU VALLEY LIGHT & POWER COMPANY, Colbran, Col., has been incorporated with a capital stock of $100,000 by Clarence L. Fenn, George Bullock and M. R. Groves.

THE CAMBRIDGE (OHIO) LIGHT & POWER COMPANY has been incorporated with a capital stock of $75,000 by Frank M. Taylor, Robert S. Ashe and Wilfred Jessup.

## Construction News

**Projects, Plans, Bids and Contracts, Contemplated or Under Way**

### New England States

LYNN, MASS.—The Eastern Massachusetts Street Railway Company has contracted with the Lynn Gas & Electric Company for energy and will close down its local power plant. A substation will be built on Union Street, to be equipped with three 1,500-kw. rotary converters and auxiliaries, to cost $125,000. The capacity will be doubled at a later date.

NORTH ANDOVER, MASS.—The M. T. Stevens & Sons Company plans to build a 2,000-hp. power plant at its local textile mill, to cost about $75,000.

PAWTUCKET, R. I.—The Blackstone Valley Gas & Electric Company has filed plans for the erection of a new one-story building at its plant on Jenks Lane for general operating service.

HARTFORD, CONN. — The Hartford Electric Light Company is erecting a new transmission line to carry electricity from the South Meadows plant to New Britain. An additional turbine will be installed in the South Meadows station, which has already been purchased.

MIDDLETOWN, CONN.—The Connecticut Power Company will soon commence work on an addition to its local power plant and will extend its transmission lines to Portland, Cromwell, Middlefield, Durham and vicinity. A new substation will be built. Plans have been prepared by the Hartford (Conn.) Electric Light Company.

NEW HAVEN, CONN.—The American Steel & Wire Company, Fairmont Avenue, will build an addition to its power house, 30 ft. x 42 ft.

### Middle Atlantic States

BUFFALO, N. Y.—Bids will be received by the Supervising Architect, Treasury Department, Washington, D. C., until June 26, for lighting fixtures for the local custom house.

COHOES, N. Y.—The Cohoes Light & Power Corporation will soon take bids for the erection of a building at its plant to be used for general operating service. William E. Goddard, 34 Remsen Street, is architect.

NEW YORK, N. Y.—The New York Edison Company plans to build a substation at 127 East 120th Street. William Whitehill, 709 Sixth Avenue, is architect.

NEW YORK, N. Y.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until June 25, for the installation of a street-lighting system on naval property. (Specification 4862.)

NEW YORK, N. Y.—Electric power equipment will be installed in the ice-manufacturing and refrigerating plant to be constructed by the Realty Managers, Inc., 342 Madison Avenue, on 170th Street between Cromwell and Inwood Avenues, to cost about $800,000.

NORWOOD, N. Y.—A hydro-electric development, including dam, power house, etc., on the Racquette River, near Norwood, to cost about $750,000, is under consideration by the Power Corporation of New York, Light and Power Building, Watertown. W. P. Creager, Northern New York Trust Company Building, Watertown, is chief engineer.

TROY, N. Y.—Electric power equipment will be installed in the proposed grain elevator to be constructed by the State Canal Board, Albany, at the local Barge Canal terminal, to cost about $750,000.

HOLLAND, N. J.—The New Jersey Power & Light Company will discontinue work on its proposed local generating plant. The project will be held in abeyance for an indefinite period.

KEARNY, N. J.—The Public Service Electric Power Company, Newark, has secured a site on the Hackensack River at Kearny for its proposed steam-operated electric generating plant, to have an initial output of 200,000 hp. The cost is estimated at $2,500,000.

TRENTON, N. J.—Bids will be received by the Board of Freeholders until July 3 for motors and other electrical equipment, in connection with a new stone-crushing plant to be installed at the county quarry, Moore's Station, for which bids will be received at the same time. H. Eltinge Breed, 507 Fifth Avenue, New York, is consulting engineer.

GRANTVILLE, PA.—The Grantville Electric Company has been organized to install and operate a local commercial system. S. S. Seyfert and H. C. Stambaugh head the company.

HUNTINGDON, PA.—The Penn Central Power Company contemplates the installation of electric equipment at its coal properties, recently acquired, to be used for fuel supply for its new generating plant at Saxton, Pa.

PHILADELPHIA, PA.—A power house will be built by the Kaufman Plush Company at Mitchell and Rector Streets for service at its mill. W. E. S. Dyer, Land Title Building, is engineer.

PHILADELPHIA, PA.—The Philadelphia Suburban Company is being organized to take over and consolidate the properties of the Philadelphia Suburban Gas & Electric Company, East Pennsylvania Gas & Electric Company, Berks County Electric Company and the Bucks Electric Company. Extensions and improvements are contemplated to plants and transmission lines.

PHILADELPHIA, PA.—R. Van Horn and F. W. Woodcock, care of James Collins Jones, Bullitt Building, attorney, representative, are organizing five electric companies to be known as the Spruce Creek Township Power Company, Jackson Township Power Company, Armagh Township Power Company, Barree Township Power Company and the Cass Township Power Company to operate in the townships named. Transmission lines and distributing systems will be installed.

SCRANTON, PA.—The Suffolk Anthracite Collieries, Inc., is planning to install electric power and other machinery at its properties.

SHARON, PA.—The proposed new sewage-disposal works will be equipped with electrically operated pumps. The cost of the work is estimated at about $200,000.

PITTSBURGH, PA.—Bids will be received by the Board of Education, Fulton

Building, until July 5, for the installation of electrical and mechanical equipment at the proposed school to be erected on Boggs Avenue. George W. Gerwig is secretary.

SPRINGDALE, PA.—The West Penn Power Company, Pittsburgh, has acquired the property of the Springdale Township Electric Corporation and plans to extend the transmission system.

GILMER, W. VA.—The Quaker Coal Company, recently organized, contemplates the installation of electric power and mechanical equipment at its properties. R. R. Biddle, 1001 Chestnut Street, Philadelphia, is head.

MARTINSBURG, W. VA.—The Eastern Sewer Pipe & Brick Company, recently organized, contemplates the installation of a power house at its proposed local plant.

MOUNDSVILLE, W. VA.—The Kerr Portland Cement Company, Wheeling, recently organized, plans to install a substation at its proposed cement mill in the Beech Bottom district, to cost about $1,200,000.

WEBSTER SPRINGS, W. VA.—Bonds to the amount of $19,000 have been voted for the construction of a municipal electric plant. The power station will be located at Cherry Falls, on the Elk River, 2 miles above the town.

WHEELING, W. VA.—The substation of the Beech Bottom (W. Va.) Power Company, at Beech Bottom, was recently destroyed by fire causing a loss of about $50,000. The structure will be rebuilt.

GLOUCESTER, VA. — The Roaring Springs Mari Company plans to build a power house at its properties.

HAMPTON ROADS, VA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 26, for four 7½-hp. motors, controllers and four sets of spare parts. (Schedule 953.)

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, until July 17, for automatic telephone equipment and air-conditioning apparatus. (Circular 1528.)

## North Central States

ANN ARBOR, MICH.—The State Legislature has appropriated $250,000 for a new power plant at the University of Michigan.

DETROIT, MICH.—The Public Lighting Commission is preparing plans for the construction of an electric power plant and substation on Morrell Street, for which bids will soon be called. Smith, Hinchman & Grylls, Marquette Building, are architects.

EAST LANSING, MICH.—The State Legislature has appropriated $75,000 for an addition to the power house at the Agricultural College.

MARQUETTE, MICH.—An appropriation of $70,000 to build a new power house at the Marquette Prison has been approved by the State Legislature.

CINCINNATI, OHIO.—The Union Gas & Electric Company has applied for a permit to erect an electric substation at Mitchell Avenue and Millcreek, to cost about $22,000.

CINCINNATI, OHIO.—The Columbia Gas & Electric Company has tentative plans under way for the construction of a new electric generating plant to cost about $10,000,000, with transmission system.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until June 29 for outdoor weatherproof, pole-type, constant-current regulators for the division of light and power.

COLUMBUS, OHIO. — The Columbus Railway, Power & Light Company has petitioned the Public Utilities Commission for permission to erect a 13,200-volt transmission line from Bexley to the Hiberian substation.

EAST PALESTINE, OHIO.—The City Council has engaged H. O. Swoboda, consulting engineer, Empire Building, Pittsburgh, to prepare plans for an additional unit for the municipal electric plant.

PIKEVILLE, KY.—The Kentucky & West Virginia Power Company has acquired the lines and franchise of the Sandy Valley Light & Power Company and will extend the system.

CHICAGO, ILL.—The Brunswick-Kroeschell Company, 460 West Erie Street, manufacturer of ice machines, is erecting a plant at 4201-5 Diversey Parkway, including an administration building, machine shop, boiler room, pattern shop and storage and power house. The cost is estimated at $700,000.

ROCK ISLAND, ILL.—Contract has been awarded by the Peoples Power Company, Moline, for remodeling its local substation, at a cost of $25,000. New equipment, to cost $50,000, will be installed. The company will erect another 13,200-volt transmission line from the power plant at Moline to Davenport via Rock Island, to cost about $56,000.

LA CROSSE, WIS.—The Wisconsin-Minnesota Light & Power Company plans to erect a transmission line from La Crosse to French Island, and also a distributing system on the island to furnish electricity there.

SHEBOYGAN, WIS. — The ornamental lighting system on Eighth Street will be extended from Eighth Street to the Chicago & Northwestern Railway Station.

BROWNSDALE, MINN.—The local electric plant will be dismantled and connection by a high-tension transmission line with Albert Lea.

MINNEAPOLIS, MINN. — Arrangements have been made by the Northern States Power Company for extensions and improvements to its systems, including an addition to the Riverside plant at Minneapolis, to cost $1,300,000; an extension to the steam-driven electric plant at Highbridge, St. Paul, to cost $2,000,000, and additions to its plant at Fargo, N. D., and Sioux Falls, S. D.

ST. PETER, MINN.—The State Board of Control, St. Paul, has commissioned the C. L. Pillsbury Company, engineer, 1209 Second Avenue, Minneapolis, to prepare plans for extensions and improvements at the local power plant to cost about $100,000.

CEDAR FALLS, IOWA.—The Cedar Valley Electric Company, Charles City, is planning to build a power plant in Cedar Falls.

CRAIG, IOWA.—Bonds to the amount of $8,000 have been authorized for the erection of a high-tension transmission line from Craig to Le Mars, connecting with the lines of the Iowa Light, Heat & Power Company there.

DUBUQUE, IOWA.—The Dubuque Electric Company has issued $3,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

SHENANDOAH, IOWA.—The City Council is reported to be considering the installation of a municipal electric plant.

SIOUX CITY, IOWA.—Work will soon be started by the Sioux City Gas & Electric Company on improvements involving an expenditure of about $3,000,000, which will include a new electric generating station, to cost about $2,000,000. The equipment will include two turbo-generators of 10,000 kw. capacity each.

ST. LOUIS, MO.—The East St. Louis Light & Power Company has applied to the Board of Supervisors of St. Clair County for permission to erect a transmission line along Mississippi Avenue from Paradise Avenue to Valentine Street in East St. Louis. The proposed line will connect with the Cahokia plant now in course of construction on the river bank south of the Municipal Bridge.

SWEET SPRINGS, MO.—The Kansas City (Mo.) Power & Light Company has applied to the Public Service Commission for permission to purchase and operate the local electric plant.

JAMESTOWN, N. D.—Bids will be received by the State Board of Administration, Bismarck, until June 26 for equipment for power house at the State Hospital for Insane.

## Southern States

NEW LONDON, N. C.—Plans are under way for a municipal electric lighting plant, for which bonds have been voted. J. W. P. Hill is in charge.

PROSPERITY, S. C.—The Saner Lumber Company, Inc., plans to build a power house at its proposed local mill.

THOMASVILLE, GA. — Plans for the proposed new John D. Archbold Memorial Hospital, to cost about $1,000,000, include a power house and refrigerating plant. E. C. Wachendorff, Forsyth Building, Atlanta, is architect.

HOGANSVILLE, GA.—The Stark Mills, Inc., operated by the International Cotton Mills, Inc., 60 Federal Street, Boston, contemplates the installation of an electric substation at its proposed local mill to cost approximately $425,000.

JACKSONVILLE, FLA. — Plans have been prepared by the Schofield Engineering Company, Philadelphia, for an addition to the electric power plant on Talleyrand Avenue and for two new substations, for which, it is understood, bids will soon be called.

JENNINGS, FLA.—The Electric Power Commission is planning to build a hydro-electric plant on the Alpha River to develop 1,600 hp. Transmission lines will be erected between Jennings and Jasper, White Springs and other points in Hamilton County.

STARKE, FLA.—Bids will be received by the Board of Trustees until June 26 for equipment for a municipal electric plant, including two electric generating units, driven by crude-oil engines, each 75 kva. capacity; two electrically driven impeller pumps, submerged type, to operate under 100-ft. and 150-ft. head respectively; storage tank, meters, auxiliary equipment. Joseph E. Craig, 427 King Street, Jacksonville, is consulting engineer.

MEMPHIS, TENN. — The Ford Motor Company, Highland Park, is reported to be planning to construct a power house at its proposed local assembling plant, to cost about $175,000.

BIRMINGHAM, ALA. — The Alabama Power Company, which is erecting a high-tension transmission line from Coosa River to Opelika, will erect a primary substation at New Aubery, where energy will be transformed and transmitted into the company's 44,000-volt lines from Opelika to Lafayette, Roanoke, Auburn, Waverly, Camp Hill, etc. The cost is estimated at $1,000,000.

CHEROKEE BLUFFS, ALA.—The Alabama Interstate Power Company, a subsidiary of the Alabama Power Company, has secured permission to construct and operate a hydro-electric power plant on the Tallapoosa River, near Cherokee Bluffs, to develop 105,000 hp., to cost about $1,000,000.

TALLADEGA, ALA.—An electric substation and transmission system will be constructed for service at the new municipal waterworks, to cost about $265,000.

HATTIESBURG, MISS.—A power house will be erected by the South Mississippi Infirmary at its new hospital, to cost about $175,000. Benjamin Price, Jefferson County Bank Building, Birmingham, Ala., is architect.

JACKSON, MISS.—The Mississippi Power & Light Company has been organized to take over and consolidate the Jackson Public Service Company; Vicksburg Light & Traction Company, Vicksburg; Delta Light & Traction Company, Greenville, and the Columbus Railway, Light & Power Company, Columbus, Miss. The new company plans to erect connecting transmission lines and also extensions to power stations, etc.

BLYTHEVILLE, ARK.—The erection of a high-tension transmission line from Caruthersville connecting Blythesville with the former and Kennet, Mo., is under consideration by the Missouri-Arkansas Power Company. The company is reported to be considering building a substation at Steele, Mo., to serve Steele, Noland, Cotter and other towns in the community.

HOT SPRINGS, ARK.—The Arkansas Light & Power Company has preliminary plans for the construction of a hydro-electric power plant on the Carpenter Dam site, with initial capacity of 12,000 kw. A similar plant is also planned at the Remmel Dam, now in course of construction, with 18,000 kw. initial capacity. Extensive additions will be made to the transmission system. The total cost is estimated at about $4,000,000. Work will soon begin on the proposed hydro-electric station on the Ouachita River, near Malvern, to develop about 15,000 hp., at a cost of about $1,500,000.

NEW ORLEANS, LA.—The Cloverland Dairy Company, Carrolton Avenue, contemplates the installation of a power house at its proposed plant, to cost about $250,000. Fayret & Liraudais, Hibernia Building, are engineers.

OKLAHOMA CITY, OKLA.—Plans are being considered by the Toledo & Ohio Central Railway Company, St. Clair Avenue and West Third Street, Cleveland, for rebuilding and equipping for electrical operation the Shawnee branch of the Missouri, Kansas & Texas Railway Company between Oklahoma City and Shawnee. The cost is estimated at about $2,600,000. J. A. Stocker, Columbus, Ohio, is chief engineer.

SAYRE, OKLA.—The City Council is having plans prepared for municipal improvements, including extensions to the ornamental lighting system, power plant, a complete disposal plant, etc. V. V. Long & Company, Colcord Building, Oklahoma City, are engineers.

HULL, TEX.—The Gulf Production Company is planning to build an electric plant in the Hull oil field, including the erection

of transmission lines to the oil fields at Batson, Saratoga and Sour Lake. The cost is estimated at about $750,000.

TEMPLE, TEX.—The power plant and mechanical shops of the Southwestern Traction Company were recently destroyed by fire causing a loss of about $100,000.

## Pacific and Mountain States

ABERDEEN, WASH.—The Pacific Cedar Manufacturing Company contemplates the construction of a power house at its proposed local mill, to cost about $150,000.

BLEWETT, WASH.—The Pehastin Lumber & Box Company is considering plans for rebuilding its mill and power house, recently damaged by fire.

LONGVIEW, WASH.—The Longview Public Service Company has acquired the property of the Long-Bell Lumber Company. Extensions will be made including the construction of a 20,000-kw. power plant, and transmission lines to supply electricity for light and power service throughout this district.

SEATTLE, WASH.—Plans are being prepared for the proposed North substation to be erected at Seventy-fifth Street and Eighth Avenue, Northeast, which will distribute electricity generated at the Skagit River plant. C. F. Uhden, Alaska Building, is chief engineer of the Skagit River project.

LA JOLLA, CAL.—Steps have been taken for the installation of an ornamental lighting system on Exchange Place.

LOS ANGELES, CAL.—The City Council has instructed the city attorney to prepare the necessary resolution authorizing the Bureau of Light of the Public Service Department to furnish electricity and maintenance for fifty lighting districts.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 3, for one 200-kw. motor-generator set complete, with four-panel switchboard, for the Mare Island navy yard. (Schedule 943).

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company will build a new substation in the vicinity of Montgomery and Sacramento Streets. The initial installation will include three 2,600-kw. rotary converters. Provision will be made for five additional rotary units of same rating. The cost is estimated at $300,000.

SAN JOSE, CAL.—Bids will be received by the Board of County Supervisors, San José, until July 2, for refrigerating and ice-making machinery, and also for construction of a building for same at the Santa Clara County Hospital, San José. Binder & Curtis, San José, are architects.

SANTA ANA, CAL.—An ordinance has been adopted providing for the installation of an ornamental lighting system on West Fourth Street, consisting of eighty-six double lamp standards.

VAN NUYS, CAL.—The Municipal Power Department will build an electric substation at the proposed service and repair plant for city automobiles, to cost about $100,000.

RENO, NEV.—The Nevada Magnesite Products Company, recently organized, plans to construct a power house at its proposed artificial stone plant, to cost about $125,000. Paul Butler is vice-president.

## Canada

RUSKIN, B. C.—Plans have been prepared by the British Columbia Electric Railway Company, Vancouver, for a 10,000-kw. hydro-electric plant at Stave Lake, to cost about $750,000. Preliminary surveys are being made for a dam and power plant to develop from 80,000 kw. to 100,000 kw. on Stave River, 2 miles north of Ruskin, to cost from $6,000,000 to $8,000,000. R. S. Kelsch, Power Building, Montreal, Que., is consulting engineer.

FORD CITY, ONT.—Plans have been prepared by the Ford Motor Company of Canada for a power house, 112 ft. x 148 ft., two stories, and a screen house, 27 ft. x 31 ft., to be erected on Sandwich Street.

QUEBEC, QUE.—The city officials have appropriated $30,887 to be used by the exhibition committee for the installation of a lighting system in the Industrial Palace and exhibition grounds.

VERDUN, QUE.—The City Council has passed a by-law to be submitted to the ratepayers providing for an expenditure not exceeding $275,000 for local improvements, of which $9,000 will be used for extension of lighting system and $10,000 for transformer station and transformers for the electric lighting system.

## Electrical Patents

Announced by U. S. Patent Office

(Issued May 29, 1923)

**1,457,023.** AUTOMOBILE HAND-SIGNALING DEVICE; A. R. Ferguson, Buffalo, N. Y. App. filed Oct. 5, 1920. Signal light attached to hand.

**1,457,052.** SYSTEM OF ELECTRICAL DISTRIBUTION; E. B. Birch, Pittsburgh, Pa. App. filed June 25, 1921. Auxiliary supply takes care of abnormal loads.

**1,457,069.** RECEIVING SYSTEM FOR ELECTRIC WAVES; L. Levy, Paris, France. App. filed Sept. 27, 1919. Medium and low frequency detector-selector-amplifier provided with vacuum tubes.

**1,457,075.** DEVICE FOR PRODUCING OR REPRODUCING SOUND; C. H. Hulbert, Chicago, Ill. App. filed March 21, 1917. Increased magnetic area of telephone receiver diaphragm.

**1,457,149.** PREPARING ALUMINUM OR ITS ALLOYS FOR ELECTROPLATING; H. D. Cunningham, Brighton, England. App. filed May 10, 1920.

**1,457,170.** TIDAL WATER-POWER PLANT; A. Huguenin, Zurich, Switzerland. App. filed Oct. 5, 1921.

**1,457,171.** CONDUIT END FITTING; F. I. Johnson, Warren, R. I. App. filed Aug. 27, 1920.

**1,457,173.** ELECTRICAL DIRECTION INDICATOR; H. Kageyama, Los Angeles, Cal. App. filed May 1, 1918. For automobiles.

**1,457,176.** BURGLAR ALARM; J. E. Lee, Milwaukee, Wis. App. filed Oct. 9, 1920. Electrically operated device fires cartridges.

**1,457,211.** RECEIVER FOR TELEPHONES; V. C. Crites, Los Angeles, Cal. App. filed June 29, 1922. Protects ear from direct contact with receiver shell.

**1,457,225.** METHOD OF MAKING MAGNESIUM; G. Hutchinson, Arcadia, Cal. App. filed June 1, 1922. By electric fusing process.

**1,457,239.** LAMP FILAMENT AND SUPPORT; A. S. Volpian, Savannah, Ga. App. filed Oct. 25, 1921.

**1,457,249.** ELECTRICAL PROTECTOR; G. W. Janson, Brooklyn, and L. H. Rovere, Richmond, N. Y. App. filed July 12, 1921. Telephone lightning arrester.

**1,457,262.** SHOT-FIRING DEVICE; H. Neal, Yukon, Pa. App. filed Feb. 25, 1922. Electrical device for firing explosives in mines.

**1,457,263.** AUTOMOBILE SIGNAL; G. W. Nicholson and A. J. Kelly, Indianapolis, Ind. App. filed April 4, 1919. Direction signal.

(Issued June 5, 1923)

**15,617 (reissue).** MEASURING AND INDICATING APPARATUS; H. Brewer, Wilmette, Ill. App. filed Feb. 21, 1919. Thermocouples for measuring temperature.

**1,457,312.** REVERSING MECHANISM; O. J. Marshick and E. L. Crosby, Detroit, Mich. App. filed Nov. 15, 1920. Automatically reversing rotation of electric furnace drum.

**1,457,336.** BALANCING CIRCUITS; H. A. Affel, Brooklyn, N. Y. App. filed Sept. 30, 1919. Translating low-frequency signals into higher-frequency carrier currents and vice versa.

**1,457,338.** SELECTIVE CONNECTION OF TRUNK LINES; L. D. Barrows and L. H. Darrow, New York, N. Y. App. filed April 1, 1919. Connecting any one of several telephone substations to a common line passing through all stations.

**1,457,359.** SYSTEM OF CONNECTIONS FOR MULTIPHASE CHOKING COILS; A. Gaudenzi, Baden, Switzerland. App. filed Aug. 29, 1921. Used with mercury-vapor rectifiers.

**1,457,381.** DYNAMO-ELECTRIC MACHINE; A. H. Midgley, Uxbridge, England. App. filed April 3, 1922. Constant-output, variable-speed generator.

**1,457,438.** PERMEAMETER FURNACE; G. A. Kelsall, Belleville, N. J. App. filed March 23, 1921. Device to determine characteristics of magnetic materials at elevated temperatures.

**1,457,440.** INCANDESCENT ELECTRIC LAMP; C. E. Leece, Youngstown, Ohio. App. filed July 6, 1921. Supplied with two or more filaments.

**1,457,447.** RADIO RECEIVING CIRCUITS; J. Mills, Wyoming, N. J. App. filed Dec. 22, 1921. Employs principle of successive detection.

**1,457,473.** COMBINATION TAIL LIGHT AND DIRECTION INDICATOR; A. E. Tinker, Stockton, Cal. App. filed March 16, 1921. For automobiles.

**1,457,475.** ELECTROMAGNETIC APPARATUS; R. W. Van Norden, San Francisco, Cal. App. filed Jan. 28, 1920. Minimizing losses due to eddy currents in generators, transformers, etc.

**1,457,508.** FOUNTAIN SOLDERING TOOL; A. Dellman, Mount Clemens, Mich. App. filed May 16, 1921. Electric soldering iron.

**1,457,513.** ELECTRIC WELDING MACHINE; J. W. Fay, Milwaukee, Wis. App. filed April 19, 1920. For automatically welding long seams and joints.

**1,457,597.** BATTERY AND BULB TESTER; O. Ohmart, Cairo, Ill. App. filed Sept. 15, 1921. Arrangement of contacts on test board.

**1,457,619.** AUDIO-FREQUENCY COUPLING TRANSFORMER; S. Cohen, Brooklyn, N. Y. App. filed May 12, 1921.

**1,457,671.** BATTERY CASE AND SWITCH; W. H. Rector, Williamson, V. Va. App. filed Jan. 17, 1923. For detonating blasting charges.

**1,457,677.** TROLLEY REPLACER; M. M. Sykes, San Francisco, Cal. App. filed Oct. 26, 1922. Auxiliary guide wheel.

**1,457,688.** PROCESS OF AND APPARATUS FOR RENOVATING COATED METAL SHEETS; C. F. H. Bohnhardt, Baltimore, Md. App. filed March 8, 1919. Removing lacquer, japan, paint, etc., by electrolysis.

**1,457,689.** CROSSOVER FOR OVERHEAD TROLLEY LINES; G. W. Bower, Schenectady, N. Y. App. filed Oct. 30, 1922. For points where single trolley wires cross lines of trackless trolley.

**1,457,690.** ELECTRICAL HEATER FOR OIL WELLS; P. F. Brine, Boston, Mass. App. filed March 22, 1921. For melting paraffin or other heavy products found in oil wells.

**1,457,718.** ELECTRIC FURNACE; I. R. Valentine, Erie, Pa. App. filed May 5, 1921. For brass, aluminum and copper melting.

**1,457,784.** TRANSFORMER; E. P. Maurer, Cleveland, Ohio. App. filed Sept. 6, 1919. Bell-ringing type.

**1,457,791.** PROCESS OF MAKING SUCCINIC ACID; J. F. Norris and E. O. Cummings, Cambridge, Mass. App. filed Oct. 20, 1922. By electrolytic process.

**1,457,792.** ELECTRICALLY HEATED FLATIRON; R. B. Older, Danville, Ill. App. filed April 14, 1921. Releasing hand from handle cuts off current.

**1,457,814.** AMPLIFIER; H. I. Becker, Schenectady, N. Y. App. filed Dec. 14, 1921. Magnetically controlled electron-tube amplifiers.

**1,457,818.** SIGNAL; C. W. Brown, Cleveland, Ohio. App. filed Feb. 1, 1922. Direction signal for automobiles.

**1,457,851.** VOLTAGE REGULATOR; A. F. Nesbit, Wilkinsburg, Pa. App. filed Aug. 27, 1921. Resistance elements inserted by temperature control.

**1,457,863.** DEVICE TO CONTROL THE TEMPERATURE OF STORAGE BATTERIES IN AUTOMOBILES; W. A. Strawmyer and V. Beaman, Atlanta, Ga. App. filed Nov. 4, 1920. Prevents overcharging.

**1,457,873.** HEAT-FOCUSING DEVICE FOR COMBINED ELECTRIC LAMPS, HEATERS AND BLOWERS; W. A. Brown, Philadelphia, Pa. App. filed Sept. 14, 1922. Telescopic casing for combined lamp, heater and blower.

**1,457,874.** COUNTERBALANCING AND OSCILLATING DEVICE FOR ELECTRIC HEATERS AND LAMPS; W. A. Brown, Philadelphia, Pa. App. filed Sept. 14, 1922. Combined heater, blower and lamp.

**1,457,896.** MOTOR-BRUSH HOLDER; J. R. Cook, Cleveland, Ohio. App. filed Aug. 12, 1921. For small alternating-current series motors.

**1,457,898.** TELEPHONE SYSTEM; W. L. Dodge, Maplewood, N. J. App. filed July 19, 1919. Relates to systems where signals are transmitted over trunk extending between widely separated offices.

**1,457,902.** CURRENT RECTIFIER; C. J. Gardeen, St. Paul, Minn. App. filed May 9, 1921. Mechanical rectifier.

**1,457,912.** TELEPHONE SYSTEM; H. D. MacPherson, Summit, N. J. App. filed Dec. 31, 1919. Signals for trunk lines controlled over single path common to lines.

**1,457,920.** ELECTRIC MOTOR CONTROL SYSTEM; T. Zewigbergk, London, England. App. filed Aug. 20, 1931. Electrically driven controller is actuated by manually operated master controller.

**1,457,923.** METHOD AND APPARATUS FOR MEASURING ELECTRIC RESISTANCES AND THE LIKE; M. Coppée, Mont-sur-Marchienne, Belgium. App. filed Nov. 12, 1921. By connecting element to be measured to armature of generator of constant field, subjecting armature to a constant couple and then measuring the speed of rotation of armature.

**1,458,098.** METHOD OR MEANS FOR AMPLIFYING OF OTHERWISE INDICATING SMALL MECHANICAL EFFECTS; E. S. Heurtley, London, England. App. filed April 11 1919. For submarine cable signals.